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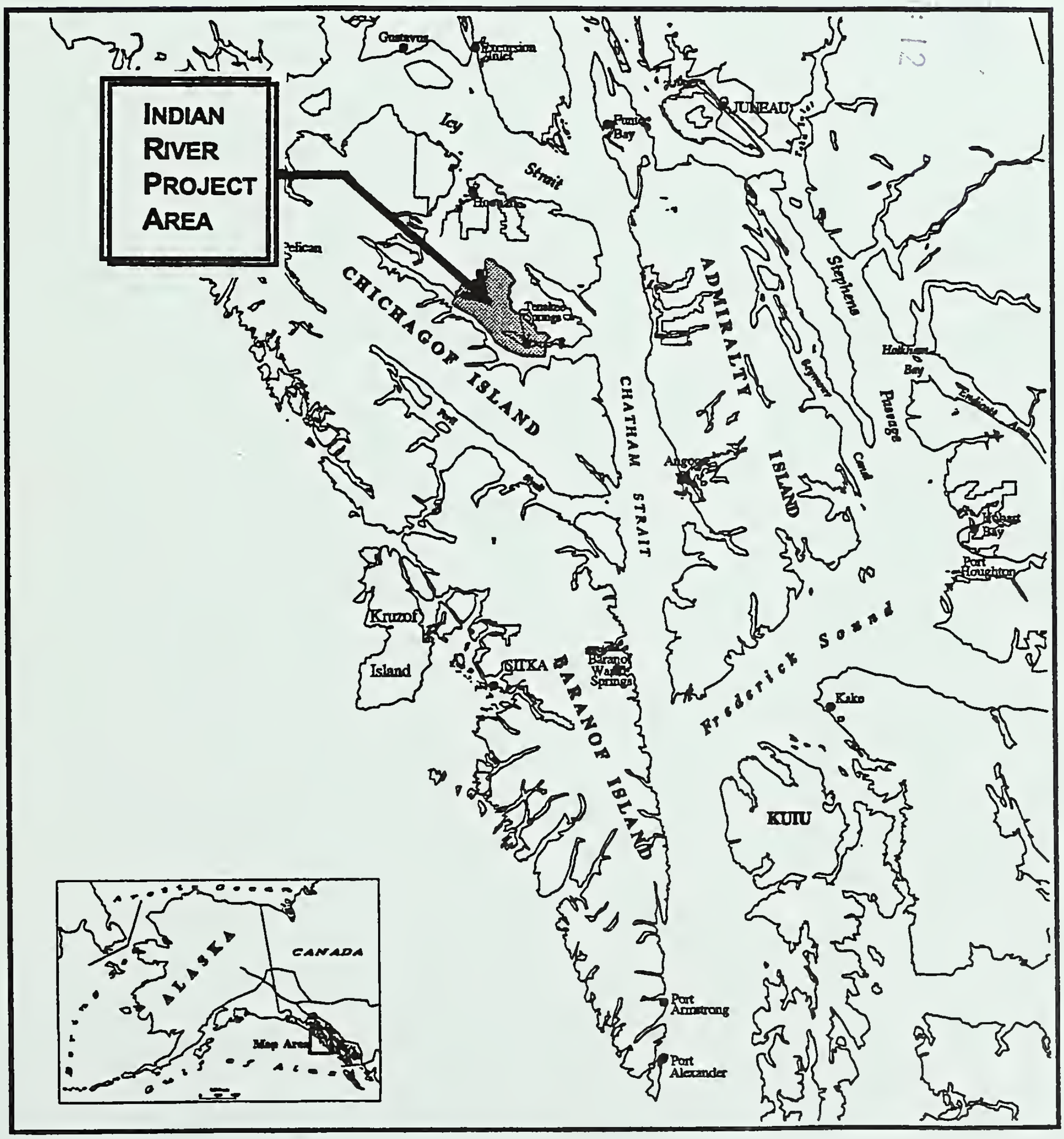
Indian River Timber Sale(s)

Draft Environmental Impact Statement

Volume I



Common Abbreviations

ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ANCSA	Alaska Native Claims Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
BMP	Best Management Practice
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
COE	Army Corps of Engineers
CZMA	Coastal Zone Management Act of 1976
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FSH	Forest Service Handbook
GIS	Geographic Information System
IDT	Interdisciplinary Team
LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris
MBF	One thousand board feet
MIS	Management Indicator Species
MMBF	One million board feet
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National Forest Management Act
OGR	Old Growth Reserves
PFL	Productive Forest Land
ROD	Record of Decision
TLMP	Tongass Land Management Plan
TTRA	Tongass Timber Reform Act
USDA	United States Department of Agriculture
VCU	Value Comparison Unit
VMC	Visual Management Class
WAA	Wildlife Analysis Area

RECORD OF DECISION
USDA FOREST SERVICE
Kensington Project
Final Environmental Impact Statement
Juneau Ranger District
Tongass National Forest - Chatham Area

DECISION TO BE MADE

This record documents my decision to select the alternative that will be used to develop the Plan of Operations for the Kensington Gold Project. This decision is based upon the analysis and evaluation in the Final Environmental Impact Statement.

ALTERNATIVES SELECTED FOR DETAILED EVALUATION

Six alternatives were evaluated, including the No Action Alternative. The range of alternatives addressed the major issues associated with this project. The five action alternatives differed from each other in the type and location of various project components.

The alternatives are summarized as follows:

Alternative A - No Action - As a result of this alternative, the Forest Service would not approve a Plan of Operations for the Kensington Project. This alternative precludes any mining and milling activities on National Forest System Lands at the project site under this proposal. Exploration activities would be allowed to continue, subject to applicable laws and regulations.

Alternative B - Applicant Proposal - This alternative consists of the project as proposed by the Kensington Venture in their Applicant Proposal, Appendix A of the Draft EIS.

- -Ore crushing would be underground
- -Ore grinding would be above ground.
- -Generators would be located at mill site.
- -Waste rock and borrow areas would be within Sherman Creek drainage.
- -Tailings slurry would be disposed of in an impoundment in Sherman Creek drainage.
- -Ophir and Sherman Creek (8,000 feet) would be diverted around the impoundment.
- -The spillway for the Ophir and Sherman Creek diversion would be constructed of concrete.
- -Water treatment methods would be alkaline chlorination and pond settling.
- -Discharge of tailings pond effluent would be to marine waters north of Point Sherman.
- -Employees would be transported from Juneau and stay at an on-site camp
- -Supplies would be transported to a Comet Beach facility with no breakwater.
- -275 Acres of land would be disturbed.

Alternative C - Berners Bay Access - This alternative would differ from Alternative B as follows:

- -Spillway would be constructed of riprap.
- -Water treatment methods include dechlorination and enhanced pond settling.
- -Employees and supplies would be transported to a terminal in Slate Creek Cove in Berners Bay. Employees would be transported to the site daily by ferry. An 8.5 mile road would be built from Slate Creek Cove to the project site. There would be only an emergency camp at the site.
- -392 Acres of land would be disturbed.

Alternative D - Sweeny Creek Tailings Disposal - This alternative would differ from Alternative B in the following items.

- -Grinding would be located underground.
- -Generators would be located near Comet Beach.
- -Tailings disposal impoundment would be in Sweeny Creek drainage. This would require an additional 2 miles of tailings slurry line.
- -Sweeny Creek (6,000 feet) would be diverted around impoundment.
- -Water treatment methods would include dechlorination and enhanced pond settling.
- -Employees would be transported by helicopter from Bridget or Yankee Cove area.
- -229 Acres of land would be disturbed.

Alternative E - Dewatered Tailings Disposal - This alternative differs from Alternative B as follows:

- -Tailings would be dewatered and disposed at one of two locations within the Sherman Creek drainage, but outside the stream channels.
- -No major stream diversions needed.
- -No tailings impoundment or spillway needed.
- -Water treatment methods would use hydrogen peroxide to destroy cyanide and would add dechlorination. Pond settling would be designed for dewatered tailings.
- -237 Acres of land would be disturbed.

Alternative F - This alternative was developed and analyzed in response to public comments on the DEIS and would differ from Alternative B as follows:

- -Water treatment methods: three options have been assessed. All three options would add dechlorination and enhanced pond settling. In addition to this, the second option would filter total suspended solids (TSS) from the effluent below the tailings impoundment. The third option would dewater the CIL portion of the mill effluent. Effluent treatment methods include hydrogen peroxide cyanide destruction and chemical precipitation of the CIL mill effluent.
- -Discharge to marine waters would be south of Point Sherman. The pipeline would be buried near the mean high tide line from the existing camp area to a point near Point Sherman.
- -277 Acres of land would be disturbed.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

Alternative A, No Action, is the environmentally preferred alternative. The definition of environmentally preferred is the alternative which causes the least damage to the biological and physical environment, and which best protects, preserves, and enhances historic, cultural, and natural resources.

DESCRIPTION OF THE FOREST SERVICE PREFERRED ALTERNATIVE

The Forest Service preferred alternative will be used in the development of the Plan of Operations for the project.

Based on the analysis and evaluation in the Final Environmental Impact Statement for the Kensington Project, it is my decision to select Alternative F with water treatment Option 1.

The choice of Option 1 is based on the assessment that the water discharged from the impoundment area can meet water quality criteria found in the Draft National Pollutant Discharge Elimination System (NPDES) permit by dechlorinating the mill effluent and enhancing the settling of suspended solids in the tailings impoundment with a combination of flocculants, baffles, and other design methods. These methods are estimated to enhance settling of TSS by 75 percent, thereby substantially reducing the discharge of TSS and heavy metals to Lynn Canal. Additional effluent treatment measures such as those described in Alternative F, Options 2 and 3, may be implemented if the final NPDES permit, or ADEC mixing zone criteria require lower concentrations of TSS, cyanide, or metals in the tailings pond effluent discharge. If violations of the NPDES permit effluent standards occur, EPA may require additional treatment of the effluent.

Approval of the marine discharge site identified in the Preferred Alternative is outside the jurisdiction of the Forest Service. It is included as a recommended site since it represents the only practical option to address concerns expressed about conflicts with anchoring vessels and the perceived threat to the high value fishery north of Point Sherman. The Clean Water Act requires a Certification of Reasonable Assurance with the Clean Water Act from the Alaska Department of Environmental Conservation and a National Pollutant Discharge Elimination System permit from the Environmental Protection Agency before final criteria for marine effluent discharge can be determined.

RATIONALE FOR THE DECISION

Alternative F was selected because it best addresses the issues identified during scoping and comments received concerning the DEIS. While some alternatives might better address certain issues, the Preferred Alternative provides the best mix for addressing them at an acceptable level.

Under Alternative F, all ground disturbance on National Forest System lands will be confined to one drainage. Based on comments to the DEIS and additional technical analysis, including considerations for installation, operation, and safety, I have decided to authorize operation of ore grinding facilities above ground and to allow power generating facilities to be located at the mill site. This differs from the Preferred Alternative identified in the DEIS. Approval is contingent upon design and monitoring verification by the proponent that structures housing these facilities can be designed to reduce noise

produced in the structures to a level no higher than 79 dBA at a distance of 50 feet from the structures. By locating the generators at the mill, waste heat can be utilized for heating the camp and mine with associated reduction in fuel consumption and some reduction in risks associated with fuel handling and storage.

All facilities (the mine, mill, waste rock disposal, rock quarry areas, tailings disposal, camp and supply loading area) will be contained in Sherman Creek drainage. This minimizes the area of ground disturbed by roads and tailings pipelines. Locating the impoundment in Sherman Creek results in slightly larger tailings surface area.

Compared with dewatered tailings, disposal of the slurried tailings in an impoundment in Sherman Creek is more stable over the long-term because it is contained by a higher strength embankment. In the case that primary spill prevention and containment measures fail, the Sherman Creek impoundment will also serve as a secondary spill containment area, since the decant valve can be closed to prevent the release of spilled material to fresh or marine waters. The trade-off is that it creates the need for long-term maintenance of the spillway to route Sherman Creek over the tailings impoundment and into the natural channel. Dewatered tailings piles would be more visible from Lynn Canal. In addition, the operational success of drying, placement, and compaction to stabilize dewatered tailings piles is questionable due to the area's high precipitation.

Discharge water quality requirements for the project will be determined by the EPA through the final NPDES permit and by the Alaska Department of Environmental Conservation through their decision of whether or not to issue a permit for a mixing zone in the marine receiving waters. If ADEC permits this zone they will also determine the size to be used for administrative purposes and the location.

Water treatment in Alternative F includes dechlorination and enhanced pond settling because the wastewater analysis indicated that the tailings pond treatment proposed in the applicant's proposal (Alternative B) would require additional treatment to meet the water quality criteria in the Draft NPDES permit. These criteria apply to the effluent at the end of the outfall pipe. The analysis indicates that additional dilution would be required for some effluent constituents (TSS, copper, lead, and total cyanide) to meet marine receiving water criteria established by the State of Alaska. The FEIS describes the impacts to marine biota within this dilution or mixing zone and in the area where effluent sediments may be deposited. The analysis indicates that there would be no significant bioaccumulation, concentration, or persistence of the materials in the environment; that there would be no adverse impact on anadromous fish spawning or rearing habitat; and there would be no barrier formed to migratory species. No practicable effluent treatment methods are available to reduce concentrations of TSS, total cyanide, and metals in the effluent to levels that meet State of Alaska marine receiving water quality criteria without allowance for dilution in a mixing zone.

Locating the marine outfall in the area south of Point Sherman would reduce potential anchor fouling conflicts with the commercial fishing fleet when they anchor in the protected area off Comet Beach. It would also avoid mixing the tailings effluent in the waters which eddy in front of Comet Beach.

Helicopter flights from the airport would utilize existing facilities at the Juneau airport and minimize impacts to recreation activities near the end of the Juneau road system.

On the recommendation of specialists in dam construction and safety, including the U.S. Army Corps of Engineers, I am withdrawing my earlier preference that the Sherman Creek spillway channel be constructed of large riprap. The channel will be constructed of concrete and designed for minimum long term maintenance. Long term bonding will be developed to assure that funds are available for long term maintenance.

Alternative B concentrates development and potential impacts in one drainage but does not provide for water treatment, dechlorination, or reducing potential conflicts associated with marine discharge north of Point Sherman.

Alternative C minimizes conflicts with marine traffic in Lynn Canal by locating the marine terminal in Slate Creek Cove but spreads the impacts over several drainages including the popular recreation area of Berners Bay. By increasing the handling of fuel and chemicals, it increases the potential for spills.

Alternative D spreads the disturbance to two drainages. A tailings slurry pipeline would be necessary to transport tailings to the Sweeny Creek tailings impoundment, increasing surface disturbance and the potential for a spill. Locating electrical generators near Comet Beach rather than at the mill site would result in the loss of the waste heat which would otherwise be used for heating the camp and underground facilities. Underground grinding would increase construction and operational costs without providing benefits. Information developed in response to comments on the DEIS indicate that noise levels associated with both the generators and grinding facilities can be reduced, through design and orientation of the facilities, to levels which will not result in increased wildlife disturbance.

Alternative E would eliminate the need to construct a dam and dispose of mill tailings directly in Sherman Creek but would require construction of a very large structure to store up to ten days of tailings during wet weather. Alternative E would create the most noise impacts to mountain goats because of truck/offloading activity. This alternative is also the most visible from Lynn Canal. Dewatering the tailings would require a third generator, increasing fuel consumption and handling. Dewatering of tailings has never been attempted on this scale in this climate, and it can be considered an unproven technology.

The General Mining Law states that mining claims on Federal lands are "free and open to exploration and purchase." Similarly, the Organic Act of June 4, 1897 states: "Nor shall anything herein prohibit any person from entering upon such national forests for all proper and lawful purposes, including that of prospecting, locating, and developing the minerals resources thereof; provided that such persons comply with the rules and regulations covering such national forests." The Mining and Mineral Policy Act and the Federal Land Policy and Management Act require responsible federal agencies to review an applicant's plan of operations to ensure that: 1) adequate provisions are included to minimize, where feasible, adverse environmental impacts on public land surface resources; 2) measures are included to provide for reclamation, where practicable; and 3) the proposed operation would comply with other applicable federal and state laws and regulations. The applicable authority for finalization and approval of the Plan of Operations is 36 CFR 228. The Kensington Project is located within lands designated as LUD II in the Tongass Land Management Plan, as amended, which allow for mineral development subject to existing laws.

PUBLIC INVOLVEMENT

A Notice of Intent was filed in the Federal Register on October 23, 1989. Public involvement began on October 19, 1989 with an agency scoping meeting attended by Federal, State, and local agencies. Public scoping meetings were held in Juneau on December 13, 1989 and in Haines on January 9, 1990. Out of this effort, a Draft Scoping Document identifying issues and concerns was sent to the public in May, 1990 for their review and comment. After receiving public comment, a Final Scoping Document was sent to the public in August, 1990.

The Draft EIS was sent to the public in June, 1990 for a 90 day comment period. Public hearings were held in Juneau on July 11 and in Haines on July 18. Included in the meetings were question and answer sessions with the Forest Service and ACZ Interdisciplinary Teams. The Juneau meeting was held in cooperation with the City and Borough of Juneau, who also participated in both the question and answer session and the hearing. Approximately 150 people attended the Juneau meeting with 30 people testifying. In Haines approximately 80 people attended with 34 people testifying. Since water quality was one of the most important issues associated with this project, water quality workshops were held August 8 in Haines and August 9 in Juneau with 15 and 25 people, respectively, attending the workshops. The workshops were held during the day with EPA's NPDES hearings held during the evening.

All meetings were announced on local TV and radio stations and in local newspapers in both communities. In addition, the Juneau and Haines newspapers have printed many articles on the proposed Kensington Mine. Presentations regarding the project have also been made to local organizations by the Forest Service.

One hundred and twenty-one comment letters were received on the DEIS and used to develop the FEIS.

MITIGATION, MONITORING, AND RECLAMATION

The FEIS identifies mitigation measures that are designed to ensure that all practicable means have been adopted to avoid or minimize potential environmental impacts from the selected alternative during the construction and operation of the Kensington Project. Chapter 2, Management, Mitigation, and Monitoring lists the mitigation measures common to all alternatives and the mitigation measures specific to Alternative B, which also apply to Alternative F. These mitigation measures are considered to be effective, and are made a part of this decision. They have been successfully used in other projects with similar types of activities. Mitigation and monitoring plans will be submitted as part of the detailed Plan of Operations.

Monitoring will determine compliance of the project with the Plan of Operations and validate projected environmental effects of the project. Much of the on-site monitoring will be financed by the operating company and conducted cooperatively with the Forest Service based on monitoring plans approved as part of the Plan of Operations. The Forest Service will be responsible for approving the monitoring plans dealing with the upland portions of this project. Standards for monitoring of tailings effluent and marine water will be approved by EPA and ADEC as part of their permits. Chapter 2 contains monitoring measures common to all action alternatives and monitoring measures specific to Alternative F. These monitoring measures are made part of this decision and will guide development of the Plan of Operations.

The purpose of reclamation is to return the disturbed areas to a stabilized and productive condition and protect long-term land and water resources. Chapter 2 of the FEIS lists the reclamation measures that will be used to develop the reclamation plan that will be part of the Plan of Operations. These measures are also part of this decision.

TONGASS LAND MANAGEMENT PLAN, AS AMENDED

Alternative F is consistent with the Tongass Land Management Plan, as amended. The site is located in Management Areas 19C and 20C which have been assigned Land Use Designation (LUD) II. The emphasis for management in this area is for major activity to be oriented toward maintaining the land in a wild and roadless condition, except for authorized uses. Mining is an authorized use.

ANILCA SECTION 810, SUBSISTENCE EVALUATION AND FINDING

As required by Section 810 of ANILCA, the effect of this project on subsistence has been evaluated in terms of, a) subsistence uses and needs, b) availability of other lands, c) other alternatives. Alternative F does not present a significant possibility of significantly restricting subsistence uses. Therefore, it is my determination that this decision will not cause a significant restriction of subsistence uses or resources.

COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED

The Coastal Zone Management Act requires the Forest Service, when conducting or authorizing activities or undertaking development directly affecting the coastal zone, to insure that the activities or development be consistent with the approved Alaska Coastal Management Program to the maximum extent practicable. I have determined that selection of Alternative F is consistent with the Alaska Coastal Management Program to the maximum extent practicable.

ENDANGERED SPECIES ACT OF 1973

No Federally listed threatened or endangered species will be affected by Alternative F.

NATIONAL HISTORIC PRESERVATION ACT OF 1966

The Forest Service program for compliance with the National Historic Preservation Act includes locating, inventorying and nominating all cultural sites that may be directly or indirectly affected by Alternative F. No known cultural resources occur in the project area.

FLOODPLAINS, WETLANDS, AND DECISION IMPLEMENTATION

Alternative F involves floodplains and wetlands. Implementation of this decision may occur no sooner than 30 days from the date of publication of the notice of availability of the FEIS in the Federal Register.

IMPLEMENTATION DATE:

Implementation of decisions made by the CHATHAM AREA FOREST SUPERVISOR, which are subject to appeal pursuant to 36 CFR Part 217, normally may not occur for 7 calendar days following publication of legal notice of the decision in the Juneau Empire newspaper, published in Juneau, Alaska. Because this decision involves floodplains and wetlands, implementation of this decision may occur no sooner than 30 days from the date of publication of the notice of this decision.

RIGHT TO APPEAL OR ADMINISTRATIVE REVIEW

This decision is subject to administrative review (appeal) pursuant to 36 CFR Part 217. A written notice of appeal, <u>in duplicate</u> must be filed with the Reviewing Officer:

MICHAEL A. BARTON
Regional Forester
Forest Service, USDA
Federal Building
P.O. Box 21628
Juneau, AK 99802-1628

The Notice of Appeal must be filed within 45 days of publication of notice of this decision in the Juneau Empire.

In accordance with 36 CFR Section 217.9, it is the responsibility of those who appeal a decision to provide the Reviewing Officer sufficient evidence and argument to show why the decision by the lower level officer should be changed or reversed. At a minimum, the written notice of appeal filed must:

1. State that the document is a Notice of Appeal filed pursuant to 36 CFR Part 217.

2. List the name, address, and telephone number of appellant;

3. Identify the decision about which the requestor objects;

4. Identify the document in which the decision is contained, by title and subject, date of the decision, and name and title of the Deciding Officer.

5. Identify specifically that portion of the decision document to which the requestor objects;

6. State the reasons for objection, including issues of fact, law, regulation, or policy and, if applicable, specifically how the decision violates the law, regulation, or policy; and

7. Identify the specific change(s) in the decision that the appellant seeks.

Gary A. Morrison

GARY A. MORRISON
Forest Supervisor

1/29/92
Date

Indian River Timber Sale(s)
Draft Environmental Impact Statement

U.S.D.A. Forest Service, Alaska Region

Tongass National Forest, Chatham Area

Sitka and Hoonah Ranger Districts

Lead Agency	U.S.D.A. Forest Service Tongass National Forest, Chatham Area 204 Siginaka Way Sitka, Alaska 99835	
Responsible Official	Gary A. Morrison, Forest Supervisor Tongass National Forest, Chatham Area	
Cooperating Agencies	U.S. Army Corps of Engineers Alaska District, Pouch 88 Anchorage, Alaska 99506-0898	U.S. Environmental Protection Agency 22 W. Seventh St., Number 19 Anchorage, Alaska 99513-7588
For Further Information, Contact	Linn Shipley, Team Leader U.S.D.A. Forest Service Tongass National Forest, Chatham Area 204 Siginaka Way Sitka, Alaska 99835 (907) 747-6671	

Abstract: The U.S. Forest Service proposes six alternatives for making timber volume available: (A) No Action; (B) to distribute timber harvest throughout the Project Area, using a landscape matrix approach to maintain levels of biodiversity and wildlife habitat; (C) to concentrate timber harvest in Value Comparison Units (VCU) 204, 216, and 222 with additional units in VCU 220 to provide a middle volume alternative; (D) to concentrate timber harvest in VCUs 204, 216, and 222 to reduce impacts on residents of Tenakee Springs; (E) to distribute timber harvest throughout the Project Area, while deferring harvest in areas of high habitat value; and (F) to distribute timber harvest throughout the Project Area and provide a high level of timber. The Forest Service Preferred Alternative is Alternative C.

Reviewers should provide the Forest Service with their comments during the review period of the Draft Environmental Impact Statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the Final Environmental Impact Statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewer's position and contentions. *Vermont Yankee Nuclear Power Corp. v NRDS*, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the Final Environmental Impact Statement. *City of Angoon v Hodel* (9th Circuit, 1986) and *Wisconsin Heritages, Inc. v Harris*, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the Draft Environmental Impact Statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3). Comments should be sent to the lead agency address above and received by January 12, 1998.

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Chapter 1

Purpose and Need

Chapter 1

Purpose and Need

Project Overview

In compliance with Federal regulations, the Forest Service has prepared this Draft Environmental Impact Statement (EIS) for proposed timber harvest and related activities in the Indian River Project Area (See Figure 1-1 for Project Area location).

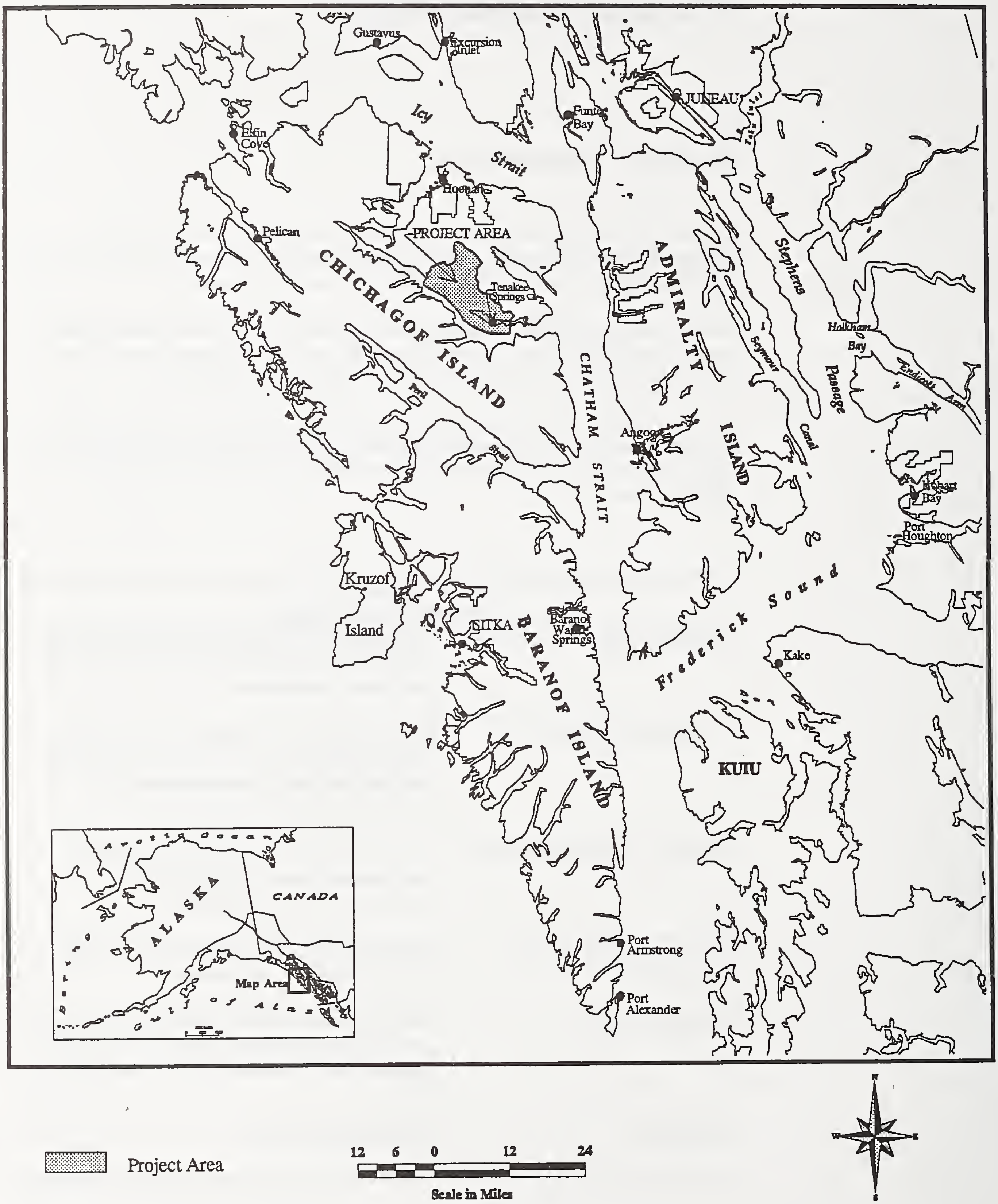
This EIS follows the format established in the Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508), and discloses the physical, biological, economic, and social consequences of five harvest alternatives, plus a no-action alternative.

The EIS is divided into four main chapters, as outlined and described in Table 1-1 below. Supporting materials are included in the Appendices, and in the project planning record on file at the Forest Supervisor's Office in Sitka. A summary of the EIS is available as a separate document.

Table 1-1
How This EIS is Organized

Chapter 1: Purpose and Need	The purpose and need for the project, decision to be made, background information, public issues, and other considerations.
Chapter 2: Alternatives	The presentation and comparison of alternatives, with information on their environmental impacts and how they would be implemented, with measures to protect the environment.
Chapter 3: Affected Environment	A description of the existing condition of the environment that may be affected by the alternatives under consideration.
Chapter 4: Environmental Consequences	Environmental changes likely to occur with the implementation of the alternatives.
Alternative Maps	Maps for each alternative considered in detail, which illustrate proposed units and roads, and display other geographic features of the Project Area.
Appendices	Supporting information.

Figure 1-1 Vicinity Map



Purpose and Need

The Indian River Timber Sale(s) Project is proposed at this time to respond to the goals and objectives identified for the Project Area by the Tongass Land and Resource Management Plan (TLMP, also referred to as the Forest Plan), and to move the Project Area toward the desired condition described in TLMP.

The Forest Plan identified the following Forest-wide goals and objectives (TLMP, pp. 2-3 to 2-4):

1) improve timber growth and productivity on suitable timber lands made available for timber harvest, and manage these lands for a long-term sustained yield of timber;
2) contribute to a timber supply from the Tongass that seeks to meet annual and TLMP planning cycle market demand; and
3) provide opportunities for local employment in the wood products industry, which in turn contribute to the local and regional economies of Southeast Alaska.

The Forest Plan also identified a desired condition for lands on which timber harvest is allowed, which includes managing suitable timber lands for the production of sawtimber and other wood products and allowing a variety of successional stages that provide a range of wildlife habitat conditions (TLMP, pp. 3-135 to 3-136, and 3-144).

As stated above, the Indian River Timber Sale(s) Project responds to the TLMP goals and objectives, as well as the desired condition for the Project Area.

Timber Growth and Productivity

Losses to the timber resource caused by age decay and disease are considerable in old-growth forests. It is not uncommon for over 30 percent of the timber volume in old-growth stands to be defective and thus unusable for wood products. Tree vigor tends to decrease with maturity, causing an increase in susceptibility to disease and decay fungi. Disease and decay processes are a natural part of forest ecosystems, and play a key role in providing wildlife habitat in old-growth forests. Harvesting aging stands, including those in declining health, on lands that allow timber harvest and replacing them with faster growing, healthy stands will reduce the volume loss associated with decay and disease and increase the growth and yield of the managed forest land.

The Forest Plan allocated approximately 72.2 percent of the land within the Indian River Timber Sale(s) Project Area to the Timber Production Land Use Designation (LUD). The desired condition for these lands, as identified by the Forest Plan, states that they are to be managed for the production of sawtimber and other wood products on an even-flow, long-term sustained yield basis (TLMP, p. 3-144). An additional 0.1 percent of the land within the Indian River Timber Sale(s) Project Area is allocated to the Modified Landscape LUD. The desired condition for these lands states that they will produce a yield of timber which contributes to the Forest-wide sustained yield (TLMP, p. 3-135).

The remaining 27.7 percent of the Project Area is allocated to the Old-growth Habitat LUD. The desired condition for these lands states that all forested areas in this LUD will have attained old-growth forest characteristics, providing a diversity of old-growth habitat types and associated species and subspecies and ecological processes. Timber volume from this LUD (such as salvage) does not contribute to the Forest-wide allowable sale quantity.

Currently, western hemlock makes up about 83 percent of the old-growth forests in the Project Area. Western hemlock is susceptible to dwarf mistletoe, a disease that does not infect Alaska yellowcedar and rarely infects Sitka spruce. Western hemlock also appears to have more insect enemies than Sitka spruce. In addition, western hemlock has the lowest economic value of the three major commercial tree species in the Project Area. Harvesting existing stands dominated by western hemlock can encourage the growth of Sitka spruce and

yellowcedar, creating a more diverse species mix and minimizing losses due to insects and diseases that are species specific. Using clearcut harvest methods and cable yarding systems will more likely provide favorable conditions for spruce and cedar regeneration rather than harvest methods using helicopters for yarding.

Market Demand

Section 101 of the Tongass Timber Reform Act (TTRA) directs the Forest Service to "seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle," to the extent consistent with the multiple use and sustained yield of all renewable forest resources. Market demand for Tongass timber is derived from factors including Southeast Alaska's timber industry mill capacity; local, national, and international timber markets; and projected local, national, and world-wide timber supplies.

The Alaska Region uses the projections of the Pacific Northwest Research (PNW) Station to help determine demand for Tongass timber. The latest PNW Station market demand estimates for Tongass timber through the year 2010 are based on three projections, or scenarios, of demand (low, medium, and high). In the low demand scenario, high stumpage, harvest, and manufacturing costs limit Alaska's share of markets. Under the high demand scenario, increased harvest and manufacturing efficiency, with resulting lower costs, make Alaskan mills more competitive. Projected annual sawlog demand for the next decade is 113 million board feet (mmbf) for the low scenario, 133 mmbf for the medium, and 156 mmbf for the high scenario (Brooks and Haynes, 1997).

The Forest Service intent is to provide the opportunity for the timber industry as a whole to acquire a supply of purchased, but unharvested timber equal to about three years of timber consumption, considering the average rate of harvest for the past few years and any indicators of change in that rate from planning cycle projections or other sources. This supply is a means of providing for stability in relation to fluctuating market demand. It is estimated that a three-year supply of timber, based on medium demand projections, is 399 mmbf.

As of June 30, 1997, there is 504 mmbf of unharvested timber volume under contract to the timber industry (Automated Timber Sales Accounting System Report 900, June 30, 1997). Of this volume, however, 300 mmbf is allocated to the Ketchikan Pulp Company under the terms of the long-term contract settlement agreement, with 204 mmbf under independent industry contract. Thus, in order to meet the intent of having a three-year supply, approximately 195 mmbf of timber needs to be cleared through the NEPA process and offered to the industry.

It takes approximately three years for a timber sale project requiring an EIS to be cleared through the NEPA process (based on the average number of months between the Notice of Intent date and the Record of Decision date for 15 EIS timber sale projects on the Tongass National Forest). At this time, there is approximately 624 mmbf proposed under other ongoing NEPA analyses on the Tongass for the 1998-2002 time period (Regional Office summary of on-going timber sales, September 1997). Timber volume from the Indian River Timber Sale(s) Project will contribute toward the intent of meeting the three-year supply of timber under contract.

Timber volume from the Indian River Timber Sale(s) Project will be provided as a component of the ten-year timber program identified by the Forest Plan, which attempts to provide timber to industry in an even flow over the planning cycle. The Forest Plan states that the Chatham Area is expected to contribute up to a maximum of 51 mmbf per year for the next ten years (TLMP 1997, Appendix L-8). This schedule is based, in part, on the

Tongass FORPLAN model, which is a linear programming software program used to analyze planning decisions regarding land use patterns, capital investment, and timber harvest scheduling.

Appendix A of this EIS provides a detailed rationale for why the Indian River Timber Sale(s) Project Area was selected for analysis at this time. In summary, Appendix A states that the Indian River Timber Sale(s) Project Area was selected at this time because:

- the TLMP allocated over 72 percent of the area as a Timber Production Land Use Designation (LUD), with sufficient timber volume available to help meet market demand;
- timber management activities will contribute to meeting the goals, objectives, and desired condition for this LUD;
- most of the other Timber Production LUDs on the Forest have or are planning to have timber management activities scheduled in them;
- timber harvest infrastructure (roads, log transfer site, rock quarries) are in place or in need of maintenance to reduce potential resource damage;
- to keep the area on the decade harvest rotation schedule (the area was last entered over 10 years ago); and
- to provide local employment opportunities in the wood products industry, consistent with providing for the multiple use and sustained yield of all renewable forest resources.

The Indian River Timber Sale(s) Project is a component of the Chatham Area's timber management plan to contribute toward the volume identified by the Forest Plan sale schedule. The project will help meet TTRA and the Forest Plan's goals and objectives. At this time, the Chatham Area has approximately 174 mmbf in additional volume undergoing NEPA analysis which could also contribute toward the sale schedule volume (Regional Office summary of on-going timber sales, September 1997). In addition, 316 mmbf in projected volume is anticipated from future Chatham Area timber sale project plans over the next ten years (see Appendix A).

Local Employment Opportunities

Timber is one of several valuable resources on the Tongass and many people depend on it for their livelihood. Timber from the Tongass is harvested for sawn wood products such as lumber and cants and wood chip exports, and is the basis for a major industry in Southeast Alaska that provided about 1,749 direct jobs in Fiscal Year 1996 (Alaska Department of Labor, May 1997).

The Tongass timber program is part of a long-term cooperative effort among the Federal government, the State of Alaska, and local governments to provide greater economic diversity and stability in Southeast Alaska and more year-round employment. The Indian River Timber Sale(s) Project would contribute toward this effort, providing the opportunity for approximately 49 average annual jobs and $2.1 million in associated average annual income. This equates to 8.24 jobs and $350,000 in associated income per million board feet harvested (Forest Service IMPLAN model - base year 1992).

1 Purpose and Need

Decision to be Made and Responsible Official

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act state that an EIS "...should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision-maker. . . ." This EIS, in accordance with CEQ regulations, is not a decision document in itself, but is written to provide sufficient information for the decision-maker.

The Chatham Area Forest Supervisor is the responsible official for this Project. He must decide whether to make timber available from the Indian River Project Area. Furthermore, if he selects an alternative which proposes timber harvest, he must decide:

- the volume of timber to make available in this area in one or more timber sales;
- the location of timber harvest units, road systems, and log transfer facilities (LTFs);
- mitigation measures and enhancement opportunities for sound resource management;
- whether there may be a significant restriction on subsistence uses.

The decision will be documented in the Record of Decision (ROD) expected in May 1998.

Project Location

The Indian River Project Area is located in the Tongass National Forest, and is situated on the northern shore of Tenakee Inlet, on Chichagof Island (Figure 1-1). The Project Area includes the major watersheds of 10-Mile Creek, Indian River, and portions of the Freshwater Creek and Game Creek drainages. The City of Tenakee Springs lies within the Project Area.

Proposed Action

The proposed action would harvest up to approximately 24 million board feet (mmbf) of timber from 1,885 acres within the Indian River Project Area on northeast Chichagof Island. This timber would be made available through two or more independent sales. Independent timber sale scheduling and volume of timber put up for bid will depend on current demand and economic conditions. As many as eight miles of new road would be built to facilitate timber removal. One previously existing log transfer facility (LTF) at Sunny Cove and one new site near 10-Mile Creek would be used to implement timber harvest.

Relationship of This Project to The Tongass Land Management Plan (TLMP)

The National Forest Management Act of 1976 (NFMA) directs each National Forest to prepare a plan to guide the management of its lands. The Tongass Land Management Plan (TLMP) was completed in 1979 and amended in 1986 and 1991. The current revised TLMP was approved in 1997 (USDA Forest Service 1997), and now guides the management of the Tongass National Forest.

1997 TLMP Transition

The Record of Decision (ROD) for the 1997 TLMP (USDA Forest Service 1997b) includes instructions for transitioning to the revised Forest Plan. Timber sale projects which were initiated under the direction of the 1979 TLMP, and which will be completed within the next few years, may be affected to varying degrees by the revised Plan. The ROD describes four categories of timber sale projects, and their relationship to the 1997 TLMP. (See 1997 TLMP ROD at page 41.) The Indian River Timber Sale(s) Project is identified under Category 3: "Timber sale projects now being planned, but for which a NEPA decision document will not be signed before the effective date of this Plan."

The ROD directs that Category 3 projects (including the Indian River Timber Sale(s) Project) need to be consistent with applicable management direction in the 1997 TLMP, except for new standards and guidelines for wildlife addressing landscape connectivity, endemic terrestrial mammals, northern goshawk, and marten management. (Discussions of direct, indirect, and cumulative effects for these wildlife resources have been included in Chapter 4 of this EIS.)

The Indian River Project EIS is "tiered" to the revised TLMP EIS (USDA Forest Service 1997a), and also to the Alaska Regional Guide EIS (USDA Forest Service 1983). General discussions from these documents and the administrative planning record are incorporated by reference rather than repeated in this EIS (40 CFR 1502.21). (See *References Cited* section following Chapter 4.)

Management Direction

The 1997 TLMP provides the primary direction for Forest management by means of the following integrated components:

- **Forest Multiple-Use Goals -** concise statements that guide the overall management of the Forest. These describe a desired future condition, expressed in broad, general terms, with no specific date by which the goals are to be achieved.
- **Forest Management Objectives** - narrative objectives for specific resources and the levels of goods and services (resource outputs) that are anticipated during the first decade of Forest Plan implementation.
- **Management prescriptions** - a description of land uses and activities which may occur on specific areas of land, such as land use designations (LUDs). The management prescriptions in the 1997 TLMP include 19 LUDs, with a range of management objectives, and specific standards and guidelines to ensure attainment of those objectives. (See Table 1-2.)
- **Forest-wide Standards and Guidelines** - the standards and guidelines that apply to all, or most, areas of the Forest. Each management prescription includes a list of those that apply to that land use designation.

(Note: Consult 1997 TLMP for a complete discussion of management direction, goals and objectives, prescriptions, and standards and guidelines for the Tongass National Forest.)

Table 1-2
1997 TLMP Land Use Designations

Non-Development LUDs		Development LUDs	
Wilderness and National Monument	**Mostly Natural**	**Moderate Development**	**Intensive Development**
Wilderness National Monument	LUD II Old-growth Habitat Research Natural Area Remote Recreation Semi-Remote Recreation Municipal Watershed Special Interest Area Wild River Scenic River Recreational River Experimental Forests	Scenic Viewshed Modified Landscape	Timber Production Minerals Transportation & Utility Systems

Source: Tongass Land Management Plan Revision Record of Decision (USDA Forest Service 1997b)

Management Prescriptions for the Indian River Project Area

The 1979 TLMP divided the Forest into land areas called value comparison units, or VCUs. VCUs are roughly equivalent to large watersheds; their boundaries usually follow easily recognizable watershed divides. The Plan also established four land use designations (LUDs) to describe certain uses and activities that could be authorized in management of the Forest. Each VCU was allocated to one of these four LUDs. As stated earlier, the 1997 TLMP has now established 19 LUDs (see Table 1-2). As used in the revised Forest Plan, a LUD is a defined area of land to which specific land use prescriptions are applied. The area within a given VCU may be allocated to more than one LUD.

The Project Area encompasses all or portions of five TLMP VCUs (see Table 1-2a and Figure 1-3). For the Indian River Project, TLMP VCU 2040 was subdivided to display only the small portion of the VCU (two percent) included within the Project Area boundary; the subdivision within the Project Area is numbered 2041. TLMP VCU 2220 was also subdivided to avoid conflicts with the Eight Fathom Timber Sale project in the western half of the VCU; the Project Area subdivision is numbered 2221, and referred to as 10-Mile Creek. Please note that these subdivision numbers are for this project only.

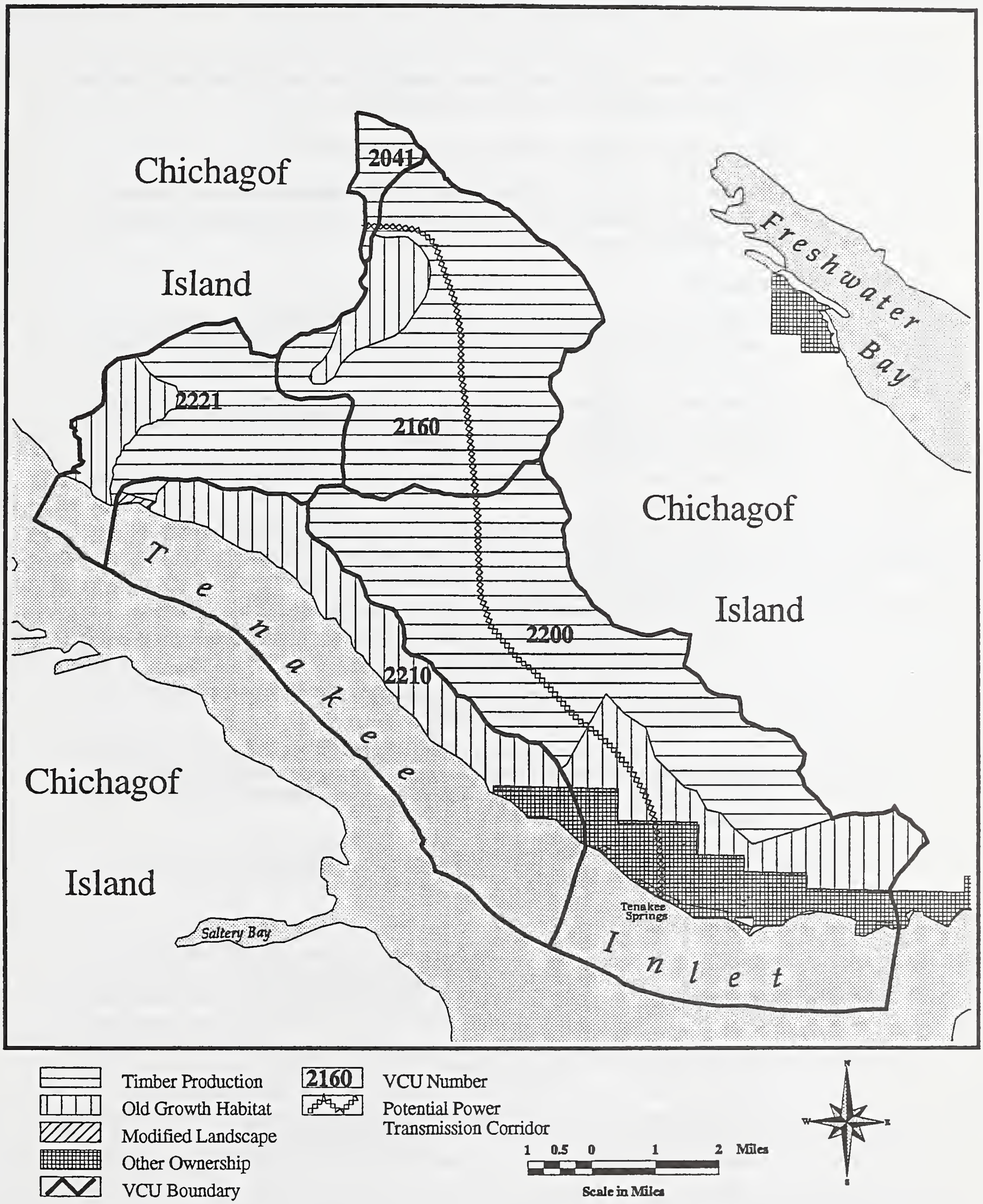
The 1997 TLMP allocates land within the Indian River Project Area VCUs to four land use designations: TM (Timber Production), OG (Old-Growth Habitat), ML (Modified Landscape), and TUS (Transportation and Utility System). Management Prescriptions for these LUDs are included in this chapter. (See Tables 1-2a through 1-2e and Figure 1-2.)

Table 1-2a
Project Area Descriptions

1997 TLMP		Project Area			
TLMP VCU Number	TLMP VCU Acres	Project Area VCU Number	Project Area VCU Name	Project Area VCU Acres	1997 TLMP LUD Designation
2220	12,271	2221	10-Mile Creek	* 5,278	TM, OG, ML
2160	10,483	2160	Freshwater Creek	10,483	TM, OG, TUS
2040	35,583	2041	Game Creek	* 750	TM, OG, TUS
2200	17,265	2200	Indian River	17,265	TM, OG, TUS
2210	4,749	2210	Whip Station	4,749	OG, ML

Source: Chatham Area GIS
* denotes partial VCUs
Note: includes non-National Forest System Lands

Figure 1-2 Map of LUDs



Land Use Designations

Land Use Designation TM (Timber Production)

This LUD encompasses portions of VCUs 2041, 2160, 2200, and 2221.

Goals

To maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood to meet society's needs.

To manage these lands for sustained long-term timber yields.

To seek to provide a supply of timber from the Tongass National Forest which meets the annual and planning-cycle market demand, consistent with the standards and guidelines of this Land Use Designation.

Objectives

Within this Land Use Designation, apply the Visual Quality Objective (VQO) of Modification in the foreground distance zone as seen from Visual Priority Travel Routes and Use Areas. Apply the Maximum Modification VQO to all other areas.

Locate and design timber harvest activities primarily to meet timber objectives. Suitable forest lands are available for timber harvest; appropriate silvicultural systems may be used. Other timber management objectives include:

- seek to reduce clearcutting when other cutting methods will meet land management objectives;
- identify opportunities for diversifying the wood products industry (such as special forest products, and value-added local production);
- use forest health management to protect resource values;
- improve timber growth and productivity on commercial forest lands;
- plan, inventory, prepare, offer, sell and administer timber sales and permits to ensure the orderly development of timber production;
- emphasize the overall reduction of costs, increase of revenues, and improvement of public service within the timber program.

Provide a spectrum of recreation and tourism opportunities consistent with the capabilities of this Land Use Designation. Manage recreation and tourism use to be compatible with timber production objectives. Manage changed recreation settings in accordance with the appropriate Recreation Opportunity Spectrum class.

Plan a transportation network of roads and helicopter access that will eventually access most of the suitable timber lands for standard logging or helicopter yarding systems.

Desired Condition

Suitable timber lands are managed for the production of sawtimber and other wood products on an even-flow, Long-term Sustained Yield basis; the timber yield produced contributes to a Forest-wide sustained yield. An extensive road system provides access for timber management activities, recreation uses, hunting and fishing, and other public and administrative uses; some roads may be closed, either seasonally or year-long, to address resource concerns. Management activities will generally dominate most seen areas. Tree stands are healthy and in a balanced mix of age classes from young stands to trees of harvestable age, often in 40- to 100-acre stands. Recreation opportunities, associated with roaded settings from Semi-primitive to Roaded Modified, are available. A variety of wildlife habitats, predominantly in the early and middle successional stages, are present.

Table 1-2b
Timber Production Land Use Designation
Apply the following Forest-wide Standards & Guidelines located in Chapter 4, 1997 TLMP.

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach and Estuary Fringe	BEACH	All	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst and Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals and Geology	MG	All	4-33
Recreation and Tourism	REC	All	4-35
Riparian	RIP	All	4-53
Rural Community Assistance	RUR	All	4-74
Scenery	VIS	All	4-75
Soil and Water	S&W	All	4-83
Subsistence	SUB	All	4-86
Threatened, Endangered, Sensitive	TE&S	All	4-88
Timber	TIM	All	4-94
Trails	TRAI	All	4-102
Transportation	TRAN	All	4-104
Wetlands	WET	All	4-111
Wildlife	WILD	All	4-112

Source: 1997 TLMP

Land Use Designation OG (Old-Growth Habitat)

This LUD encompasses portions of VCUs 2041, 2160, 2200, 2210 and 2221.

Goals

Maintain areas of old-growth forest and their associated natural ecological processes to provide habitat for old-growth associated resources.

Manage early seral conifer stands to achieve old-growth forest characteristic structure and composition based upon site capability. Use old-growth definitions as outlined in *Ecological Definitions for Old-growth Forest Types in Southeast Alaska* (R10-TP-28).

Objectives

Provide old-growth forest habitats, in combination with other Land Use Designations, to maintain viable populations of native and desired non-native fish and wildlife species and subspecies that may be closely associated with old-growth forests.

Contribute to the habitat capability of fish and wildlife resources to support sustainable human subsistence and recreational uses.

Maintain components of flora and fauna biodiversity and ecological processes associated with old-growth forests.

Allow existing natural or previously harvested early seral conifer stands to evolve naturally to old-growth forest habitats, or apply silvicultural treatments to accelerate forest

succession to achieve old-growth forest structural features. Consider practices such as thinning, release and weeding, pruning, and fertilization to promote accelerated development of old-growth characteristics.

To the extent feasible, limit roads, facilities, and permitted uses to those compatible with old-growth forest habitat management objectives.

Desired Condition

All forested areas within this Land Use Designation have attained old-growth forest characteristics. A diversity of old-growth habitat types and associated species and subspecies and ecological processes are represented.

Table 1-2c
Old-growth Habitat Land Use Designation
Apply the following Forest-wide Standards & Guidelines located in Chapter 4, 1997 TLMP.

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach and Estuary Fringe	BEACH	All	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst and Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals and Geology	MG	All	4-33
Recreation and Tourism	REC	All	4-35
Riparian	RIP1	All	4-53
	RIP2	I,II(A-E,G,H)	
Rural Community Assistance	RUR	All	4-74
Scenery	VIS1, 12	All	4-75
	VIS11	I,II(A,E)	
Soil and Water	S&W1111,1112,2	All	4-83
	S&W112	I(A:1-4,6-7),II,III	
Subsistence	SUB	All	4-86
Threatened, Endangered, Sensitive	TE&S	All	4-88
Timber	TIM111,111-1,130,140	All	4-94
	TIM114	VIII	
Trails	TRAI	All	4-102
Transportation	TRAN	All	4-104
Wetlands	WET	All	4-111
Wildlife	WILD112	I-VIII; IX(A:1-8,11,B); X-XVIII	4-112
	WILD22,23	All	

Source: 1997 TLMP

Land Use Designation ML (Modified Landscape)

This LUD encompasses a small portion of VCUs 2210 and 2221 near the mouth of 10-Mile Creek.

Goals

To provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments in the foreground distance zone.

To recognize the scenic values of suitable timber lands viewed from identified popular roads, trails, marine travel routes, recreation sites, bays, and anchorages, and to modify timber harvest practices accordingly.

To maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood products to meet society's needs.

To seek to provide a supply of timber from the Tongass National Forest which meets the annual and planning-cycle market demand, consistent with the standards and guidelines of this Land Use Designation.

Objectives

Within this Land Use Designation, apply the Visual Quality Objectives of Partial Retention, in the foreground distance zone, and Modification, in the middleground and background distance zones, as seen from the Visual Priority Travel Routes and Use Areas. Apply the Maximum Modification VQO to all other areas.

Suitable forest lands are available for timber harvest. Utilize appropriate silvicultural systems consistent with the adopted VQOs. Other timber management considerations include:

- seek to reduce clearcutting when other cutting methods will meet land management objectives;
- identify opportunities for diversifying the wood products industry (such as special forest products, and value-added local production);
- use forest health management to protect resource values;
- improve timber growth and productivity on commercial forest lands;
- plan, inventory, prepare, offer, sell and administer timber sales and permits to ensure the orderly development of timber production;
- emphasize the overall reduction of costs, increase of revenues, and improvement of public service within the timber program.

Provide a spectrum of recreation and tourism opportunities consistent with the capabilities of this Land Use Designation. Semi-primitive to roaded experiences may be offered. Avoid changes to semi-primitive non-motorized settings when feasible.

Design roads and associated rock quarries to meet the applicable Visual Quality Objective.

Desired Condition

In areas managed under the Modified Landscape Land Use Designation, forest visitors, recreationists, and others using popular travel routes and use areas will view a somewhat modified landscape. Management activities in the visual foreground will be subordinate to the characteristic landscape, but may dominate the landscape in the middle and backgrounds. Within the foreground, timber harvest units are typically small and affect only a small percentage of the seen area at any one point in time. Roads, facilities, and other structures are also subordinate to the foreground landscape. Recreation opportunities associated with natural-appearing to modified settings are available. A variety of successional stages provide a range of wildlife habitat conditions. A yield of timber is produced which contributes to Forest-wide sustained yield.

Table 1-2d **Modified Landscape Land Use Designation** Apply the following Forest-wide Standards & Guidelines located in Chapter 4, 1997 TLMP.			
Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach and Estuary Fringe	BEACH	All	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst and Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals and Geology	MG	All	4-33
Recreation and Tourism	REC	All	4-35
Riparian	RIP	All	4-53
Rural Community Assistance	RUR	All	4-74
Scenery	VIS	All	4-75
Soil and Water	S&W	All	4-83
Subsistence	SUB	All	4-86
Threatened, Endangered, Sensitive	TE&S	All	4-88
Timber	TIM	All	4-94
Trails	TRAI	All	4-102
Transportation	TRAN	All	4-104
Wetlands	WET	All	4-111
Wildlife	WILD	All	4-112

Source: 1997 TLMP

Land Use Designation TUS (Transportation and Utility System)

This potential power transmission corridor LUD crosses VCUs 2041, 2160, and 2200.

Goals

To provide for, and/or facilitate the development of, existing and future major public Transportation and Utility Systems, including those identified by the State of Alaska and the Alaska Energy Authority.

Objectives

Apply this management prescription to existing major systems corridors. Use the prescription as criteria in the planning and design of future system corridors. During the period before actual construction of new systems occurs, the management prescription(s) of the (initial) Land Use Designation(s) underlying the corridors will remain applicable. Upon initiation of construction, and during system operation, this management prescription will apply.

For application of this Land Use Designation, "major systems" are defined as state and Federal highways, railroads, powerlines 66 kV or greater, and pipelines 10 inches or greater in diameter.

Allow special uses and facilities not related to transportation or utility systems, if compatible with present or future systems.

If the development of systems changes the Recreation Opportunity Spectrum setting, manage recreation and tourism opportunities in accordance with the new setting. Consider

the development of recreation and tourism facilities in conjunction with the planning of State or Federal highways or reservoirs.

Following construction of systems, lands in the Right-of-Way, if permanently cleared, will be considered unsuitable for timber production.

Transportation and utility corridors, to the extent feasible, should follow the same route.

Transportation and Utility Systems may dominate the seen foreground area, yet are designed with consideration for the existing form, line, color, and texture of the characteristic landscape.

Minimize and/or mitigate adverse effects to wildlife habitat and populations to the extent feasible.

Maintain the present and continued productivity of anadromous fish and other fish habitat to the extent feasible.

Desired Condition

Transportation and Utility Systems have been constructed in an efficient and economic manner, and have been designed to be compatible with the adjacent Land Use Designation to the maximum extent feasible. The minimum land area consistent with an efficient, safe facility is used for their development. Effects on other resources have been recognized and resource protection has been provided. Other resources uses and activities in the area do not conflict with utility operations.

Table 1-2e

Transportation and Utility Systems Land Use Designation

Apply the following Forest-wide Standards & Guidelines located in Chapter 4, 1997 TLMP.

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach and Estuary Fringe	BEACH	All	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst and Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals and Geology	MG	All	4-33
Recreation and Tourism	REC	All	4-35
Riparian	RIP	All	4-53
Rural Community Assistance	RUR	All	4-74
Scenery	VIS	All	4-75
Soil and Water	S&W	All	4-83
Subsistence	SUB	All	4-86
Threatened, Endangered, Sensitive	TE&S	All	4-88
Timber	TIM111-1,130,140	All	4-94
	TIM114	VIII	
Trails	TRAI	All	4-102
Transportation	TRAN	All	4-104
Wetlands	WET	All	4-111
Wildlife	WILD	All	4-112

Source: 1997 TLMP

How the Indian River Project Area was Selected

Prior to scheduling the Indian River Area for environmental analysis, the Forest Service analyzed all "development" land use designations (LUDs) on the Chatham Area and divided the LUDs into approximately 50 geographical areas (see Table 1-2). These areas were then grouped into approximately 18 potential project areas (including the Indian River Project Area) for which timber harvest activities could be proposed and environmental analyses completed. The potential project areas were identified based on common geographic features, past harvesting activity, pending legislative action, and estimated available volumes of timber.

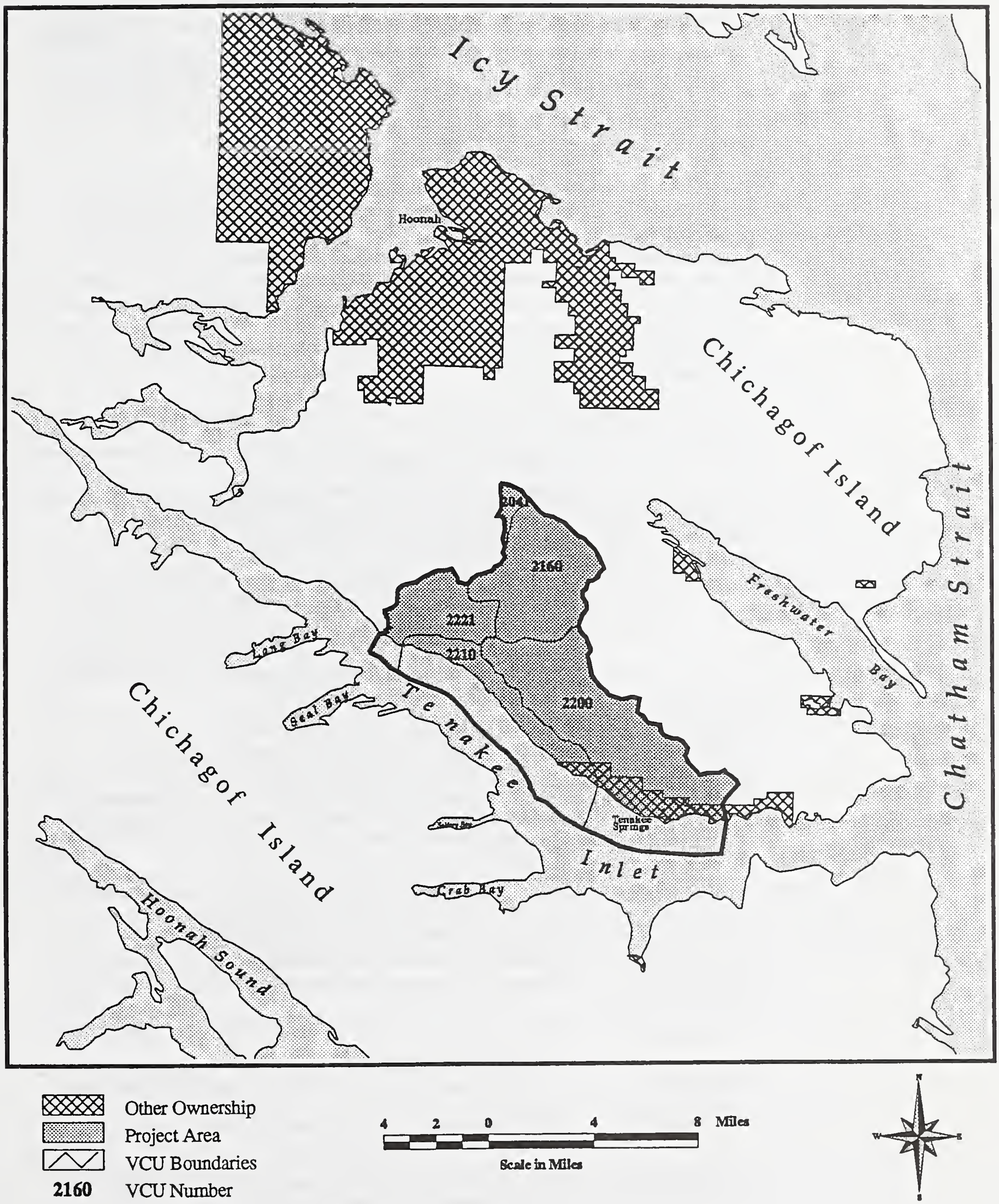
The Chatham Area Forest Supervisor selected the Indian River Project Area for environmental analysis because it contains a sufficient amount of harvestable timber volume on lands designated as Timber Production LUD. Under the 1997 TLMP, harvest of the area is appropriate. Available information indicates that harvest of the amount of timber being considered for this project is consistent with the 1997 TLMP, standards and guidelines, and other requirements for resource protection. For additional details on why the Indian River Project Area was selected, see Appendix A.

Scope of the Project

National Forest planning is accomplished at two levels: the program and the project level. The program level includes Forest Plans, Regional Guides, and other multi-Forest or Regional analyses. The project level includes site-specific analysis such as timber sales and facility construction projects.

Project level planning is focused on implementation of management direction provided by program level decisions. For example, in the case of the Indian River Project, the management direction is provided by TLMP and the Alaska Regional Guide. The scope of this EIS is limited to project-specific issues, actions, alternatives, and impacts. Decisions or issues associated with higher level planning and direction such as the TLMP or the Alaska Regional Guide will not be addressed or analyzed.

Figure 1-3 Map of VCUs



Public Involvement

The CEQ regulations for implementing NEPA require agencies to encourage and facilitate public involvement in decisions that affect the quality of the human environment. To that purpose, a diligent effort was made to involve the public in the Indian River Project. This included legal notices, scoping documents, public meetings, and other formal and informal public contacts. This Draft EIS, the subsequent public comment period, and the subsistence hearings are a continuation of that effort.

The NEPA also states that there shall be an early and open process for determining the scope of issues to be addressed and for determining the significant issues related to the proposed action. It refers to this process as "scoping." Notices of Intent to initiate the project were published in the Sitka Daily Sentinel, the Juneau Empire, and the Federal Register. Public meetings were held in Angoon, Tenakee Springs, and Hoonah, Alaska to solicit information from the public. Documents were published and distributed describing the project during the scoping period. Affected Federal, State, and local agencies, as well as Federally recognized Indian tribes and other interested groups and individuals were invited to participate.

Table 1-3 summarizes the public involvement process for the Indian River Project.

Table 1-3
Public Involvement and Scoping Activities

November 1, 1995	Notice of Intent (NOI) published in the Federal Register announcing decision to initiate an EIS for the project.
November 1, 1995	Scoping document providing information and seeking public comment mailed to approximately 200 individuals and groups that had previously shown interest in Forest Service projects in Southeast Alaska. The mailing list includes Federal and State agencies and divisions, Native and municipal offices, businesses, organizations, groups, and individuals.
November 2, 1995	Meeting with Hoonah Indian Association.
November 6, 1995	Legal advertisement for NOI published in Sitka Sentinel.
November 7, 1995	Legal advertisement for NOI published in Juneau Empire.
November 29, 1995	Scoping meeting in Tenakee Springs. Seven attendees from local public.
November 30, 1995	Scoping meeting in Hoonah. No attendees from local public.
December 8, 1995	Public scoping period closed. Nine letters received.
March, 1996 - January, 1997	Development of tidelands MOU with City Council of Tenakee Springs, LTF MOU Committee, and registered voter input.
April - July, 1996	Personal interviews with residents of Tenakee Springs and private outfitter and guides.
May 7, 1996	Scoping meeting in Angoon. Seven attendees from local public.
April 18, 1997	Public meeting in Tenakee Springs, for Finger Mountain Project. Twenty attendees from the local public.
September 27, 1997	Public meeting in Tenakee Springs, for Finger Mountain Project. Twenty attendees from the local public.

Collaborative Stewardship with Other Agencies

In the early 1990's, the Alaska Department of Fish and Game provided an employee to serve on a Forest Service ecosystem team ("ECOTeam") which was preparing a landscape analysis of the Northeast Chichagof Island. The ECOTeam was responsible for developing an ecosystem management approach to landscapes larger than the Indian River Project Area.

The Army Corps of Engineers and the Environmental Protection Agency were invited to be cooperating agencies in the development of this EIS in 1995. These two agencies, as well as the Alaska Departments of Natural Resources and Environmental Conservation have also been involved with various permitting processes with the Forest Service for this project. The U.S. Fish and Wildlife Service was informally consulted regarding Threatened and Endangered species in 1996.

The Forest Service worked closely with the City of Tenakee Springs in order to develop a use agreement for City owned tidelands for a log transfer facility in Sunny Cove. The City ordinance approving the use agreement was voted on and approved by a majority of the registered voters (27 yes - 5 no) in January , 1997.

The Forest Service met with representatives from the interagency implementation team on September 23, 1997 (U.S. Fish and Wildlife Service, Alaska Division of Governmental Coordination, Department of Fish and Game, and Department of Environmental Conservation) and October 10, 1997 (National Marine Fisheries Service and Environmental Protection Agency) to review the extent to which the new wildlife standards and guidelines added in the 1997 TLMP Record of Decision (USDA Forest Service 1997b, page 41) should be incorporated into the Indian River Timber Sale(s) Project. The new wildlife standards and guidelines address landscape connectivity, endemic terrestrial mammals, northern goshawk, and American marten. The intent of these new standards and guidelines is to avoid some possible long-term cumulative effects. The meetings further developed the communication with the other resource management agencies regarding the timber sale planning process. See Chapter 4, Wildlife and Threatened, Endangered, and Sensitive Species sections for more information regarding this collaborative stewardship effort.

The 1997 TLMP standard and guideline to consult with the Alaska Department of Fish and Game in identifying and managing important brown bear foraging sites in the Indian River Project Area occurred on September 30, 1997. See Chapter 4, Wildlife - Brown Bear section for more information regarding this effort.

Contacts with the Hoonah Indian Association

On August 3, 1994, the Forest Service and the Hoonah Indian Association (HIA) entered into a Memorandum of Understanding (MOU). The purpose of the MOU is "...to establish a framework for cooperative relationships between the Forest Service and the Hoonah Indian Association for carrying out the unique relationship and obligations the United States Government has with Indian Tribal Governments. This shall serve as a vehicle through which the Forest Service maintains a legal and political relationship with the local tribal government in Hoonah." In keeping with the spirit of this MOU, the Indian River Project Team (ID Team) has made an effort to maintain and strengthen the Forest Service's working relationship with HIA throughout the planning for this Project.

Issues To Be Addressed

The NEPA requires Federal agencies to determine the scope of the issues to be addressed and to identify the significant issues related to the proposed action. For the Indian River Project, these issues were identified through the scoping process described in the previous section. Issues were raised by individuals; organizations; other Federal, State, and local agencies; and affected Indian tribes.

Issues raised during scoping were analyzed and similar issues grouped when appropriate. The following issues were determined to be significant and within the scope of the project. In formulating alternatives, each of the issues was considered and addressed in some manner in all alternatives. Other issues were considered but eliminated from detailed study because resolution falls outside the scope of this project.

Issue Area 1

Subsistence

The focus of this issue is the impact of the proposed action on the availability of wildlife, marine life, and plants for customary and traditional use by rural Alaska residents. The Alaska National Interest Lands Conservation Act (ANILCA) specifically requires the Forest Service to determine if proposed activities may significantly restrict subsistence use.

The units of measure that will be analyzed for effects regarding this issue include the abundance and distribution of subsistence resources (such as habitat capability of deer), competition from other resource users by community, and the ability and methods of subsistence resource users to access the Project Area.

Issue Area 2

Fish Habitat and Water Quality

Fish and water resources in Southeast Alaska are important for subsistence, recreation, ecological, and economic reasons. The focus of this issue is the impact of timber harvest and associated road construction on water quality and fish habitat.

The units of measure that will be analyzed for effects regarding this issue include changes in sedimentation levels, chemical water quality, stream water temperatures, and stream flows, total road miles in stream buffers and number of stream crossings.

Issue Area 3

Biodiversity and Wildlife

The Project Area supports a wide variety of wildlife and plant species. Sitka black-tailed deer populations are of particular concern. Logging may reduce important winter habitat for deer and may contribute to reduced deer populations in some areas over the long term. Changes in other habitats and populations of other wildlife species may also occur. The focus of this issue is the impact of timber management activities on biodiversity levels, wildlife populations and overall management of ecosystems.

The units of measure that will be analyzed for effects regarding this issue include acres of wildlife habitat and habitat capability (for deer), acres of old-growth, number and size of old-growth patches, and acres of wetland.

Issue Area 4 — Log Transfer Facilities (LTFs) and Camp Location

There is public concern about the location of LTFs and logging camps, and the potential environmental effects associated with their construction and operation. The focus of this issue is the impact of constructing and operating LTFs at Sunny Cove and 10-Mile Creek and logging camp locations.

The units of measure that will be analyzed for effects regarding this issue include the number and location of LTFs and logging camps.

Issue Area 5 — Economic Values

Some communities in Southeast Alaska depend on timber and other natural resources from the Tongass National Forest to support their economy and lifestyles. This issue focuses on the capability of the Project Area to provide a long-term sustained flow of timber and other resources, and on whether this associated level of outputs is sufficient to meet the needs of dependent local communities.

The units of measure that will be analyzed for effects regarding this issue include the annual number of direct and indirect job opportunities created and estimated annual average wages.

Issue Area 6 — Social Values

The focus of this issue is the impact of timber management activities on the social values of local communities, especially Tenakee Springs. Residents of Tenakee Springs are especially concerned about potential disruptions to their way of life that could result from such activities. Several components that make up "way of life" have been grouped under the general heading of social values. Quality of life is subjective and not easily measured.

Some of the social value concerns that residents feel could disrupt their way of life include: interference with use of the East Tenakee Trail; noise and pollution from timber management activities and logging camps; changes in visual resource quality, recreational opportunities, and subsistence opportunities; reduced eco-tourist and outfitter/guide income; water quality and fisheries resource impacts on commercial fishing income; and potential impacts on heritage, karst, and cave resources.

The units of measure that will be analyzed for effects regarding this issue include acres by Recreation Opportunity Spectrum classification and Recreation Place, commercial recreation/tourism use and income, commercial fisheries income, subsistence measures (see Issue Area 1 above), degree of risk to heritage resources, and mapped karst vulnerability characteristics.

Issue Area 7 — Alternatives to Traditional Clearcutting

During public scoping, it was suggested that a minimal amount of clearcutting be planned for the Indian River Project. Concern centered on clearcutting effects on old-growth fragmentation, fish and wildlife resources, and biodiversity. The focus of this issue is the impact of different silvicultural harvest systems on various forest resources.

The units of measure that will be analyzed for effects regarding this issue are harvest method by acres and harvest method by volume. (Note: habitat capability model results for deer were adjusted to reflect reduced impacts when using harvest methods other than traditional clearcutting.)

Other Issues

The NEPA also requires that issues which will not have a significant effect on the human environment or which have been covered by prior environmental review be identified and eliminated from detailed study. The following issues were raised during scoping.

Ketchikan Pulp Company

Several scoping comments were received regarding Ketchikan Pulp Company (KPC), including suggestions that the KPC contract be terminated. Others felt that no timber from this Project should be provided to KPC. In March 1997, the KPC contract was mutually canceled. At this time, the timber volume from the Indian River Project is scheduled to be made available as independent timber sales.

Small Timber Sales

Maintaining a timber supply capable of supporting very small sales (as small as ten trees), and personal use is a concern. Timber sales of this size would not be precluded by this project, and could, in fact, be improved by increased access to the Project Area through road construction and reconstruction.

Permits and Licenses

To proceed with the timber harvest as addressed in this Draft EIS, various permits must be obtained from other agencies. Administrative actions on these permits would take place after the Final EIS is filed with the Environmental Protection Agency. This would be no sooner than 50 days following publication of notice of this decision in the Daily Sitka Sentinel and the Juneau Empire. The agencies and their responsibilities are listed below.

U.S. Army Corps of Engineers

- Approval of discharge of dredged or fill material into waters of the United States (Section 404 of the Clean Water Act of 1977, as amended).
- Approval of construction of structures or work in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1899).

U.S. Environmental Protection Agency

- National Pollutant Discharge Elimination Systems Review (Section 402 of the Clean Water Act).

State of Alaska, Department of Natural Resources

- Authorization for occupancy and use of tidelands and submerged lands.
- Authorization for occupancy and use of State-owned uplands.

State of Alaska, Department of Environmental Conservation

- Solid Waste Disposal Permit (Section 402 of Clean Water Act).
- Certificate of Reasonable Assurance (Section 401 Clean Water Act) which certifies compliance with Alaska Water Quality Standards (Section 401 Certification).

U.S. Coast Guard

- Coast Guard Bridge Permit (in accordance with the General Bridge Act of 1946).

Legislation Related to This EIS

The following laws are relevant to the preparation of EISs for actions on Federal lands. Some of these are specific to Alaska, while others pertain to all Federal lands.

Administrative Procedure Act, 1966
Alaska National Interest Lands Conservation Act (ANILCA) of 1980
Alaska Native Allotment Act of 1906
Alaska Native Claims Settlement Act (ANCSA) of 1971
Archaeological Resource Protection Act of 1980
Bald and Golden Eagle Protection Act, USC 668 (1940 as amended)
Clean Air Act of 1970 (as amended)
Clean Water Act of 1977 (as amended)
Endangered Species Act of 1973 (as amended)
Federal Cave Resource Protection Act of 1988
Forest and Rangeland Renewable Resources Planning Act of 1974
Marine Mammal Protection Act of 1972
Multiple-Use Sustained Yield Act of 1960
National Environmental Policy Act (NEPA) of 1969 (as amended)
National Historic Preservation Act of 1966 (as amended)
National Forest Management Act (NFMA) of 1976 (as amended)
Native American Graves Protection and Repatriation Act of 1990
Tongass Timber Reform Act (TTRA) of 1990
Wild and Scenic Rivers Act of 1968
Executive Order 11988 (floodplains)
Executive Order 11990 (wetlands)
Executive Order 12898 (environmental justice)
Executive Order 12962 (recreational fisheries)

In addition, the Coastal Zone Management Act (CZMA) of 1976, as amended, pertains to the preparation of the EIS. This act, passed by Congress in 1976 and amended in 1990, requires Federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that proposed developments are consistent with approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Zone Management Act in 1977 to establish a program that meets the requirement of the Coastal Zone Management Act. This program as amended, contains the standards and the criteria for determining the consistency of activities within the coastal zone. The results of this determination are presented in the *Other Environmental Consequences* section at the end of Chapter 4.

Reduction of Paperwork and the Availability of the Planning Record

Reduction of paperwork as specified in 40 CFR 1500.4 has been an important consideration in preparation of this EIS. The objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated.

The Planning Record is available at the Forest Supervisor's Office in Sitka. The proposed alternatives were field verified and the planning record contains this site-specific detail. Other reference documents such as the 1997 Tongass Land Management Plan, the Tongass Timber Reform Act, the Resources Planning Act, and the EIS, are available at public libraries around the region as well as at the Supervisor's Office in Sitka and other Forest Service offices.

Chapter 2

Alternatives Including the Proposed Action

Chapter 2

Alternatives Including the Proposed Action

Chapter 2 describes the proposed action (Alternative B), and compares it with a no-action alternative (Alternative A) and four other action alternatives developed in response to the issues described in Chapter 1. The alternative comparison is based on the description of the existing environment provided in Chapter 3, and the environmental effects of each alternative as discussed in Chapter 4. Alternatives considered but eliminated from detailed study are also briefly discussed, as well as enhancement opportunities, mitigation measures, and monitoring.

This chapter summarizes the key elements needed by the decision maker. For a full understanding of the alternatives and the analysis, consider the alternative maps, the details included in Chapters 1 through 4 of the EIS, and the Appendices.

Alternative Development

The action alternatives in this EIS were developed as site-specific proposals which could clearly display environmental consequences. Collectively, they explore ways to satisfy public concerns and resolve the issues discussed in Chapter 1, while responding to the purpose and need for the project. Each action alternative responds differently to the issues. This range of alternatives will give the Forest Supervisor a basis for making an informed decision.

Standards and guidelines in the 1997 TLMP, Alaska Regional Guide, and applicable Forest Service manuals and handbooks were followed in identifying a tentatively suitable land base, from which alternatives were developed. The tentatively suitable land base within the Project Area contains approximately 140 million board feet (mmbf) of timber.

In addition to complying with the above standards and guidelines, specific areas within the Project Area were avoided to provide further resource protection. These include:

- No harvest in Old-growth Land Use Designations (LUDs). This would also accommodate the concerns of Tenakee Springs residents regarding timber harvest effects on recreation and scenic quality in Tenakee Inlet.
- No harvest in the small Old-growth LUD located west of proposed Road #75007. This LUD is composed of a cedar plant community that is an underrepresented ecosystem in the Project Area.
- Avoid harvest in the Riparian Management Areas (RMAs). This would maintain riparian functions that affect water quality and wildlife habitat. (See discussion of RMAs in the Soils, Water, and Fish sections of Chapters 3 and 4.)
- No harvest along Road #7502 in the area where VCUs 2221 and 2160 meet. This would maintain a wildlife corridor.

Considerations In The Development Of Alternatives

The first step in formulating alternatives was to develop a logging plan that identified a "pool" of timber harvest units and associated road systems from the tentatively suitable land base. The pool was examined in the field and reviewed by the Indian River Project Interdisciplinary Team (ID Team) before it was finalized. Then, harvest units were selected from the pool and assigned to each of the alternatives.

The proposed harvest units were analyzed at two levels: the Northeast Chichagof landscape level and the stand level. The landscape level considered effects of management practices over large areas (such as VCUs, watersheds, or viewsheds). At this level, timber harvest was concentrated in certain areas, with large tracts of old-growth being left undisturbed in other areas. (See the landscape ecology section in Chapter 3 for further discussion of landscape analysis.)

The stand level dealt with individual harvest units. The following concepts were considered during the selection and design of individual harvest units and roads, while assigning them to specific alternatives:

- Abrupt edges were reduced by unit placement and by feathering the edges of the units.
- In larger harvest units, the edge effect was minimized by using fringe and stream buffers for corridors between old-growth blocks.
- Stand diversity was provided by leaving snags in harvest units (where safety regulations allow), or by retaining small patches of uncut timber in harvest units where feasible and practical.

All proposed harvest units were visited to determine existing stand health and structure. Wind disturbance patterns were also noted. Based on the results of these site visits and the analysis of data gathered, five harvest methods were proposed. Three are even-aged management methods and two are uneven-aged. Each action alternative incorporates both methods.

Even-aged management regenerates and maintains stands in which trees of essentially the same age grow together. The three even-aged methods for this project are clearcutting with green tree retention, overstory removal, and patch clearcuts. While patch clearcuts as described in this EIS technically may be a two-aged system, for the sake of simplicity they are considered an even-aged method in this project.

Uneven-aged management regenerates and maintains multi-aged (at least three age classes), multi-layered stands by removing either individual or small groups of trees in all age classes. Three or more harvest entries are made over a complete stand regeneration cycle. The two uneven-aged methods for this project are single tree selection and group selection. Very little is known about the ultimate success of uneven-aged management in Southeast Alaska.

Figure 2-1 Patch Clearcuts (20, 35, 50 Percent)

Even-Aged Management

20 Percent Patch Clearcuts

Patch clearcuts are harvested areas generally less than 10 acres in size, dispersed throughout a timber harvest unit. The percentage of volume to be removed from each unit varies, depending on the resource management objectives for the individual unit. Where only 20 percent of the volume would be removed, critical winter habitat for deer (especially below 800 feet and on south facing slopes) would be maintained. The remaining canopy (80 percent) would be left to intercept snow and to encourage growth of forage plant species. Units would be evaluated for future entries in 20 to 30 years, based on the canopy closure and forage levels. (See Figure 2-1).

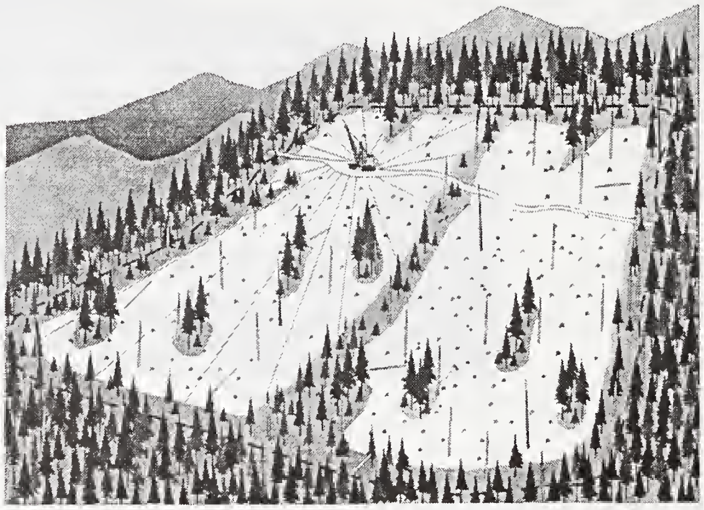
35 Percent Patch Clearcuts

Where the objective is to maintain soil stability by retaining vegetation root strength, patch cuts would be designed to only remove 35 to 40 percent of the volume in the unit. Future harvest would be considered in about 20 years, and would depend on the stability of the soils and the ability of the vegetation to hold soils in place. (See Figure 2-1).

50 Percent Patch Clearcuts

Where the objective is to maintain travel corridors to the alpine (especially for deer), patch cuts would remove 50 percent of the volume in the unit. Leaving 50 percent of the canopy would provide cover for deer and other wildlife species. Units would be evaluated for re-entry in 20 to 30 years. The decision to re-enter would be based on canopy closure (see Figure 2-1).

Figure 2-2 Clearcuts with Green Tree Retention



Clearcuts with Green Tree Retention

This harvest method removes nearly all merchantable trees from a unit, leaving some snags and green trees (10 percent), to comply with standards and guidelines for marten habitat protection. This results in conditions similar to those found after a large, intense wind event. Clearcutting is generally the optimum silvicultural system for old-growth hemlock-spruce forest in Southeast Alaska. Clearcutting with Green Tree Retention enables near maximum timber production. Leave trees would provide habitat for marten and cavity-nesting wildlife, and may reduce some visual impacts. Structural diversity in the new stand would be increased as well. Retained trees may be uniformly scattered across the unit, clumped into small groups, or spaced around the edges of the unit, depending on the type of yarding equipment used. (See Figure 2-2.)

Figure 2-3 Overstory Removal

Overstory Removal

Overstory Removal is new to Southeast Alaska and has not been done on the Chatham Area. It is proposed in the Project Area to minimize visual and soil impacts, and to use existing mid-story and understory to gain added stand structure and diversity. With this method, important old-growth attributes (significant large tree component, snags, and large down woody material) can be retained. Reserve trees may be regularly spaced or grouped to meet treatment objectives.

The managed stand structure may be two or three storied, depending on the existing stand conditions and marking guidelines. Overstory Removal allows for a range of moderate to heavy forest retention. Techniques for determining which trees to harvest include using tree diameter limits (where all trees over or under a specified diameter are maintained), or by establishing a desired volume per acre to be retained. (See Figure 2-3.)

Figure 2-4 Group Selection

Uneven-Aged Management

Group Selection

Group Selection is a harvest method designed to facilitate natural regeneration. Clearcuts ranging from 0.5 to 2 acres in size are dispersed throughout the identified unit, removing 20 percent of the volume in the unit. Systematic harvest entries (referred to as "cutting cycles") are then made at regular intervals over time, until all the volume in the unit is removed. For example, a cutting cycle removing approximately 20 percent of the trees might occur every 40 to 50 years. In this case, five cutting cycles would be needed (over a period of 160 to 200 years) to harvest the entire original stand. The end result would be a variety of age and size classes present across the unit through time.

Group Selection mimics small wind disturbance patterns occurring across much of the Project Area. Small-scale, frequent wind disturbances often result in small patches of trees being blown over, creating gaps in the stand canopy. As Group Selection is implemented over time, a similar diverse, multi-layered canopy is produced. These different canopy layers remain in distinct small areas rather than interspersed across the entire area. (See Figure 2-4.)

Figure 2-5 Single Tree Selection

Single Tree Selection

Single Tree Selection is an uneven-aged regeneration method that removes individual trees more or less uniformly throughout the unit. In order to make yarding of single tree selection units feasible in this project, trees would be harvested in small clumps (usually four to eight trees). This regeneration method leaves a diverse, multi-layered canopy cover across the entire unit, thus addressing concerns for wildlife, soils, and scenic quality. Cutting cycles would be similar to those for the group selection units. (See Figure 2-5.)

Alternatives Eliminated from Detailed Study

The two alternatives described below were considered during the early stages of the alternative development process and were subsequently eliminated from detailed study.

An alternative was considered that would build a connecting road from the Project Area to the Salt Lake Bay LTF. This road would have extended from the end of the 10-Mile Creek road (Forest Service Road #7502) to Forest Service Road #7578. A subsequent log haul analysis indicated it was over twice as expensive to haul timber to the Salt Lake Bay LTF than to develop an LTF at either the Sunny Cove or 10-Mile Creek LTF sites. Additionally, the connecting road would not comply with constraints in the Tongass Timber Reform Act (TTRA). (Note: The TTRA states "The Secretary of Agriculture shall not ... engage in any further efforts to connect the City of Tenakee Springs with the logging road system on Chichagof Island, unless the City Councils of Tenakee Springs and Hoonah both determine that the road should be constructed and so inform the Secretary.")

Another alternative considered providing access to the Project Area from the Hoonah road system by constructing a road to transport logs to the existing, permitted Kennel Creek LTF. The logging camp would be located at Kennel Creek, which would address camp location concerns raised by Tenakee Springs residents. A portion of existing Forest Service Road #7500 would be eliminated near the boundary of VCUs 2160 and 2200, to comply with the TTRA requirements. Other action alternatives address issues related to LTF and logging camp locations; the alternative was considered redundant, and was subsequently eliminated from detailed study.

Alternatives Considered In Detail

As mentioned earlier, six alternatives (five action alternatives and a no-action proposal) were considered in detail for this project. Each alternative was developed to respond differently to the issues, and to provide a range of choices for the decision maker. Maps are included (distributed with this Draft EIS) which display the proposed roads and harvest units for each of the alternatives. Table 2-3 summarizes the volume and acres of timber harvest, logging systems, harvest methods, and roads proposed for development and use. Table 2-4 summarizes the cumulative effects of the alternatives.

Alternative A (No Action)

Alternative A represents the existing conditions in the Project Area, and serves as the base-line against which the effects of all other alternatives are measured. There will be no new resource outputs associated with this alternative. No road construction or timber harvest would occur. Additional receipts to the State of Alaska would be foregone, existing timber-related jobs would not be sustained, and no new opportunities for timber-related jobs would be created. Routine maintenance (such as culvert cleaning), tree thinning, and removal of unsafe bridges may continue. (See Alternative A map and Table 2-4.)

Alternative A responds to Issue Area 3 (Biodiversity and Wildlife) by implementing timber stand improvement plans (i.e., thinning of previously harvested units) as funding allows; benefits of thinning include improved wildlife habitat. The no-action alternative also responds to Issue Areas 4 (Log Transfer Facilities and Camp Location) and 6 (Social

Values); deferring timber harvest in the Project Area would result in no harvest-related noise, disruption to use of East Tenakee Trail, user conflicts (loggers vs. recreationists/ subsistence users), or changes in scenic resource quality. The alternative also responds to Issue Area 5 (Economic Values) by maintaining community dependence on other natural resources than timber (e.g., recreation, subsistence use) in support of their economy and lifestyles.

Alternative B (Proposed Action)

Alternative B is the Proposed Action as presented during public scoping. This alternative sustains levels of biodiversity and wildlife habitat by emphasizing uneven-aged management, and by maintaining wildlife travel corridors and lower elevation old-growth forest stands throughout the Project Area. Although many acres and units are entered, uneven-aged management maintains habitat characteristics; changes in scenic resource quality are also reduced. (See Alternative B map and Tables 2-3 and 2-4.)

Alternative B particularly addresses Issue Area 7 (Alternatives to Traditional Clearcutting) by harvesting the least amount of acres using clearcut harvest methods. It also responds to concerns in Issue Area 6 (Social Values) regarding noise, scenic quality, and disruption of saltwater fishing in the areas of the log transfer facilities (LTFs); since use of two LTFs is proposed, smaller harvest volumes would be moved through each, thus reducing impacts and recovery times at each site.

The alternative proposes to harvest 23.8 mmbf of timber (sawlog and utility) on 1,885 acres. This figure differs from that published in the Notice of Intent (34.3 mmbf) due to more accurate volume per acre estimates and field verified refinements to unit boundaries. There would be approximately 7.8 miles of new road construction and 21.6 miles of reconstruction.

The former LTF at Sunny Cove (VCU 2200) would be reconstructed and a new LTF near the mouth of 10-Mile Creek (VCU 2210) would be constructed. Both LTFs would be drive-down ramps. A floating log camp would likely be located at Corner Bay (across Tenakee Inlet). Log rafts from the 10-Mile Creek LTF would likely be stored at Seal Bay (also across Tenakee Inlet) due to lack of protection from wind and waves at the 10-Mile Creek site.

High cost mitigation measures (retaining walls, anchored piers, etc.) are incorporated into the design of the 10-Mile Creek road accessing saltwater. These design measures would reduce the risk of slope failure and potential impacts to other resources.

Road Management Objectives (RMOs) for this alternative include keeping mainline roads open at Maintenance Level 2 (passable by high clearance vehicles), and closing temporary roads after use. Drainage structures would be removed. Roads 75004, 75012, 75003, 75007, 75021, and 7502 would be closed. (See Appendix D for detailed descriptions of maintenance levels.)

Alternative C

Alternative C reduces impacts on the community of Tenakee Springs by concentrating timber management activities in the Freshwater Creek, 10-Mile Creek, and the upper portion of Indian River drainages. Harvest systems would include cable, helicopter, and shovel yarding systems. Some units are prescribed for uneven-aged management. (See Alternative C map and Tables 2-3 and 2-4.)

Alternative C presents an overall balanced treatment of the issues, with a mix of resource outputs. Economic and social values concerns regarding disruption of recreation/tourism in the lower Indian River drainage (Issue Areas 5 and 6) are addressed in the long-term by avoiding harvest activities in this area.

The alternative proposes to harvest 28.7 mmbf of timber (sawlog and utility) on 1,856 acres. There would be approximately 9.5 miles of new road construction and 21.7 miles of reconstruction.

The former LTF at Sunny Cove would be reconstructed as a drive-down ramp. A floating log camp would likely be located at Corner Bay (across Tenakee Inlet).

RMOs for this alternative include keeping mainline roads open at Maintenance Level 2, for administrative use only. Temporary roads would be closed. Drainage structures would be removed on roads 75004, 75012, 75007, 750071, 7508, 7501, 75021, 75028, and 7502. The LTF at Sunny Cove could be removed and both gates on Road 7500 would be closed.

Alternative D

Alternative D reduces potential timber harvest impacts on the community of Tenakee Springs to a greater extent than Alternative C, by deferring most harvest activities in the Indian River watershed (VCU 2200). This alternative concentrates harvest in Freshwater and 10-Mile Creek drainages, with only one unit in the upper Indian River drainage. The resulting emphasis is on clearcut harvest to improve economic efficiency. Harvest systems would include cable, helicopter, and shovel yarding systems. Uneven-aged management would be utilized where necessary to maintain resource values. (See Alternative D map and Tables 2-3 and 2-4.)

Alternative D particularly addresses Issue Area 5 (Economic Values) by only harvesting one unit in the Indian River drainage, and using the 10-Mile Creek LTF site. This would avoid disrupting the recreation/tourism income generated in the Indian River drainage and Sunny Cove. It also responds to concerns in Issue Area 6 (Social Values) by only minimally disrupting use of the East Tenakee Trail for a few days; by generating almost no noise in Sunny Cove or the Indian River drainage; and by decreasing the wildlands experience of the area the least.

The alternative proposes to harvest 24.0 mmbf of timber (sawlog and utility) on 1,586 acres. There would be approximately 9.2 miles of new road construction and 10.7 miles of reconstruction.

Alternative D utilizes a drive-down ramp LTF that would be built at the proposed 10-Mile Creek site. A floating log camp and log raft storage area would likely be located at Seal Bay.

High cost mitigation measures (retaining walls, anchored piers, etc.) have been incorporated into the design of the 10-Mile Creek road accessing saltwater. These design measures would reduce the risk of slope failure and potential impacts to other resources.

RMOs for this alternative include closing all roads to motorized vehicles after harvest and maintaining all system roads at Maintenance Level 1. Both gates on Road 7500 would be closed. All bridges would be removed in VCUs 2041, 2160, and 2221. In VCU 2200 unsafe log stringer bridges would either be removed or warning signs would be posted.

Alternative E

Alternative E emphasizes maintenance of deer habitat. This would be accomplished by leaving large blocks of old-growth forest on the south-facing slopes in Indian River and the lower elevations at 10-Mile Creek above the estuary. Harvesting would be done in all three drainages. Elements of Landscape Ecology (for example, maintaining large blocks of unfragmented old-growth, and considering patch size) are emphasized in the alternative design. (See Alternative E map and Tables 2-3 and 2-4.)

Alternative E particularly addresses Issue Areas 1 (Subsistence) and 3 (Biodiversity and Wildlife), in that it reduces acres of deer habitat, old-growth, and wildlife riparian habitat the least. It also responds to concerns in Issue Area 4 (Log Transfer Facilities and Camp Locations) by harvesting the smallest amount of volume and using only one LTF and logging camp for the shortest period of time. Issue Area 6 (Social Values) is addressed by changing scenic resource quality the least.

The alternative proposes to harvest 24.5 mmbf of timber (sawlog and utility) on 1,665 acres. There would be approximately 8.4 miles of new road construction and 21.6 miles of reconstruction.

The former LTF at Sunny Cove would be reconstructed as a bulkhead to facilitate loading logs on barges. An upland camp would likely be located at Corner Bay.

RMOs for this alternative include closing all temporary roads, and removing all bridges in VCUs 2041, 2160, and 2221. The Sunny Cove LTF bulkhead would be removed. Both gates would be closed on Road 7500; the road would be maintained at Level 2 for administrative (high clearance vehicle) traffic only. The remaining roads in VCU 2200 would be closed, with drainage structures removed.

Alternative F

In Alternative F, harvesting would be concentrated in all three drainages (Indian River, Freshwater, and 10-Mile Creek). The alternative emphasizes timber sale economic efficiency and receipts to Federal, State, and local governments by utilizing cost efficient, ground-based yarding and harvest systems. Helicopter yarding systems would be used only where necessary. Uneven-aged management is utilized where necessary to maintain resource values. (See Alternative F map and Tables 2-3 and 2-4.)

Alternative F particularly addresses Issue Area 5 (Economic Values), in that it generates the largest income and opportunity for jobs.

The alternative proposes to harvest 36.9 mmbf of timber (sawlog and utility) on 2,355 acres. There would be approximately 9.7 miles of new road construction and 22.1 miles of reconstruction.

A new LTF (Sunny Too), approximately 1,000 feet west of the former LTF at Sunny Cove, would be constructed as a bulkhead to facilitate barging. A floating camp would likely be located at Corner Bay.

RMOs for this alternative include closing all temporary roads, and removing all bridges in VCUs 2041, 2160, and 2221. The Sunny Too LTF bulkhead would be removed. Only administrative (high clearance vehicle) traffic would be allowed on Road 7500 in VCU 2200. Recreational traffic would be discouraged on this road segment by closing both gates. On the newly built portions of Road 7500 in VCUs 2160 and 2041, drainage structures would be removed, and the road would be placed in Maintenance Level 1. Drainage structures would be removed on Roads 7508, 750071, 75004, 75028, 75012, 75003, and 75007.

Actions Common To All Alternatives

All action alternatives would include building roads and log transfer facilities (LTFs), harvesting timber, and providing camp facilities for workers. A range of options and methods is available for each of these activities, as described below. With these defined, their effects on the natural resources can be evaluated.

Roads

Timber harvest in Southeast Alaska typically requires roads for transporting logs from harvest units to a LTF. All roads on the National Forest are built to appropriate standards to handle planned traffic and minimize environmental impacts. A typical road network is made up of specified arterial, collector, and local roads. Arterial and collector roads are the backbone of the transportation system, accessing large land areas. They provide long-term access for recurrent resource management activities. Local roads often branch from arterials and collectors to access small groups of units or a single unit.

In addition to these, temporary roads are constructed by the timber purchaser when needed for one-time, short term harvest access. After log haul is completed, temporary roads are removed by installing waterbars in the roadbed and removing drainage structures. The miles of planned road construction for each alternative are displayed in Table 2-3.

Once constructed, the forest road system is managed to provide necessary access for accomplishing land use objectives and activities. Environmental protection, user safety, recreation, and road maintenance for future use are taken into consideration in planning for road management. Roads may be kept open , physically or administratively closed, or obliterated. Common methods of road closure include bridge removal, signing, gating, and barricading. Roads that are permanently closed have all drainage structures removed, to provide free passage of storm runoff. Rock can be removed from temporary roads, and stock-piled for use in future road construction. Tables in Appendix D indicate how the roads in this project would be managed following timber harvest. In accordance with the Tongass Timber Reform Act (TTRA), no road would connect the Indian River road system to the Game Creek roads or any other Chichagof Island road system.

Log Transfer Facilities (LTFs)

Low-Angle Ramp

The low-angle ramp is a log transfer facility (LTF) constructed of rock, placed on a 10 to 12 percent grade. The running surface width of the ramp varies from 20 to 30 feet, and may include armor rock for protection from wave action. The low end of the ramp terminates at a -2.0 foot elevation. A log stacker or front-end loader carries the log bundle down to the ramp and places the bundle in the water. The ramp has a low profile and blends in with the surrounding terrain. Construction costs are low ($5-15,000) and the "footprint" (LTF area) is kept to a minimum (less than 0.25 acre). Velocity of log bundles entering the water is near zero.

Low-Angle Slide

The low-angle slide is an LTF constructed of rock and steel pipe rails, placed on a 10 to 12 percent grade. The running surface width of the rock ramp is typically 30 feet. The rails are placed on the ramp, with the top end of the rails at an elevation of +15.0 feet, and the low end terminating at -2.0 foot. A log stacker or front-end loader places the log bundles on the rails and pushes the bundles down the rails until they float on the water. The low-angle slide has a low profile and blends in with the surrounding terrain. Construction costs vary depending on the site conditions ($50-80,000). Between periods of non-use, the rails can be removed and used on other sites. The footprint is kept to a minimum (less than 0.25 acre). Velocity of log bundles entering the water is near zero.

Bulkheads

Bulkheads are operations platforms used for placing log bundles either directly into the water (for rafting) or onto barges, with the assistance of an A-Frame, crane, or front-end loader. Bulkheads have been constructed from a variety of materials. The most common is the native log crib. Steel rail cars and sheet piling are two other types of material used.

A-Frame or Crane. Bulkheads used to transfer logs directly to the water for rafting are sited in water depths of -2.0 feet, with a top elevation of +22 to 24 feet. The face of the bulkhead is 60 to 80 feet wide. An A-frame or crane lifts the log bundles from the trucks and lowers them into the water. Entry velocity is controlled by the operator and the design of the system. The area of intertidal fill depends on the slope of the shoreline, and is normally less than 0.50 acre. Large quantities of shot rock fill are needed. This LTF type is suited for beaches with steep gradients. Construction costs range from $40-80,000. The visual profile of the bulkhead is higher than the ramp type.

Small Barge. Small barges carry approximately 400 mbf of timber. Bulkheads used to transfer logs to a small barge are sited in water depths of -2.0 foot, with a top elevation of +12.0 feet. The bulkhead face is 30 feet wide. Construction costs are low, ranging from $10-20,000. The footprint is kept to a minimum (less than 0.25 acre). Small barge bulkheads can also be used for equipment off-loading, which minimizes impacts to intertidal waters.

Large Barge. Large barges carry approximately 1,200 mbf of timber. Bulkheads used to transfer logs to a large barge are sited in water depths of -12.0 feet, with a top elevation of +24.0 feet. The bulkhead face is 40 feet wide. Construction costs are high, ranging from $150-300,000. The footprint is usually less than 0.40 acres. A large barge bulkhead requires a separate equipment off-loading facility, which increases impacts to intertidal waters. This type of LTF is designed for permanent installations, and has a 40 to 50 year design life.

Log Rafting and Storage Areas

When logs are placed directly into saltwater for rafting, an area is needed at or near the LTF to form the logs into rafts. The water area needed to construct these rafts is usually 400 feet by 700 feet. The rafting area is located in deep enough water so that the rafts will not go aground. Harvested logs are trucked from the woods to the LTF, then banded together, placed into the water, and moved to their respective rafts by a boom boat. The logs are usually sorted into three different types of rafts (sawlog, pulp log, and cedar rafts) prior to being towed to the mill. The Forest Service is required to obtain permits for the rafting area from the U.S. Army Corps of Engineers, Environmental Protection Agency, and the State of Alaska.

Log rafts from the 10-Mile Creek LTF would likely be stored at Seal Bay due to lack of protection from wind and waves in the 10-Mile Creek LTF area. Log rafts from the Sunny Cove LTF would be stored in Sunny Cove.

Camp Facilities

The size of timber sale logging camps in the Project Area will depend on the size and combination of sales. For sales ranging from 10 to 15 mmbf, camps should accommodate from 30 to 100 people. Land-based logging camps are usually family camps. Living and office space are provided by temporary modular structures and mobile homes, and one or more rough-lumber equipment storage and maintenance shops. Electricity is supplied by a diesel-powered generator. A typical floating camp provides the living and office space on a single barge type structure, with primary water and sewage treatment systems. Electricity on the barge is supplied by a diesel-powered generator.

An upland or floating camp at Corner Bay would be the most likely place to support a LTF in the Sunny Cove area. Corner Bay is located approximately three miles south of the Project Area. Access to the Project Area would be by boat across Tenakee Inlet. With the camp not located near the LTF, a watchman trailer and maintenance shop would likely be required at the LTF site.

A floating camp would be required to support the proposed LTF at 10-Mile Creek. The camp would probably be in Seal Bay, which is located approximately two miles south of the 10-Mile Creek LTF. Access to the LTF would be by boat across Tenakee Inlet.

Logging Systems

Yarding or skidding is the process of moving felled logs from the stump to the landing. This can be done with ground-based equipment (shovels), cable logging systems (running skyline, live skyline, and slackline), or helicopters. The method used depends on factors such as access, topography, slope, and resource protection needs. Cable, shovel, and helicopter logging systems are proposed in the action alternatives.

The moist, soft soils and steep slopes in the Project Area make it difficult to operate ground-based equipment (e.g., track or rubber tired skidders). Except for shovel yarding with track-mounted log loaders, there has been little opportunity to use this type of equipment. Shovel logging is the process of moving logs with a log loader. It is generally limited to slopes of less than 30 percent. Portions of proposed harvest units that are designated for cable yarding may be suited for shovel yarding.

Helicopter logging has been established as a viable logging system on the Chatham Area. Logs are lifted off the ground and flown (usually downhill) to landings or salt water. This system causes the least impact to soils and minimizes road construction, but has the highest yarding cost. Helicopter logging is approximately two to three times more expensive than ground-based logging. Helicopters are typically used in situations where road access is precluded, or where other yarding systems would cause unacceptable soil displacement or vegetation damage. Helicopter yarding distances can be as much as a mile or more, but the high cost of operations usually restricts their use to distances of 3,000 to 4,000 feet. (See Glossary for further discussion of logging systems.)

All of the above logging systems may be used for clearcut harvest. For partial removal of the standing timber (with the objective of retaining regeneration, individual trees, or groups of trees), the preferred logging systems are uphill running skyline, uphill live skyline, or helicopter. These systems obtain the necessary lift and control of the logs during yarding to prevent damage to residual trees. Table 2-1 compares proposed logging system acreages for the action alternatives.

Each logging system has advantages, disadvantages, and constraints which limit its applicability. The logging systems proposed for harvest units in the Indian River Project address the advantages of each system within these constraints.

Stream Protection Measures

All alternatives include measures which protect water quality and fish habitat, such as Best Management Practices (BMPs), TTRA buffers, and Riparian Management Areas (RMAs). The TTRA mandates a minimum 100-foot buffer on all Class I streams and on Class II streams that flow directly into Class I streams. The buffer width may be greater than 100 feet due to topography, riparian soils, a windfirm boundary, timber stand boundaries, logging systems requirements, and varying stream channel locations. In addition, RMAs include Class III streams that influence water quality; these streams have been buffered to the slope break of the channel or to a windfirm boundary to protect water quality. Besides protecting water quality and fish habitat, these measures will maintain riparian habitat important to other species such as brown bear and furbearers. (See the Soils, Water, and Fish section in Chapter 4 for a detailed discussion of stream protection measures.)

Comparison Of Alternatives By Identified Issue

The following sections compare the alternatives by identified issue, proposed activity, and environmental consequence. This comparison draws together conclusions from information presented throughout the EIS, and briefly summarizes analysis results. The no-action alternative (Alternative A) is the baseline for comparing. (See Tables 2-3 and 2-4 for numerical comparisons.)

Issue Area 1 — Subsistence

Concerns about potential impacts of further deer winter range reductions affecting subsistence deer hunting needs were evaluated. No significant possibility of a significant restriction to subsistence use was found for any Indian River Project alternative. (See Subsistence, Table 4-24). Alternative E has the least potential effect (reduced habitat capability) on subsistence use of deer; Alternative F would have the highest effect.

However, considering cumulative effects, it is projected that there is a significant possibility in all alternatives (including the no action alternative) of a significant restriction for subsistence use of deer. Over the short-term (year 2010), this is due to the likelihood of a critical winter occurring on average once every 11 years, resulting in season and/or bag limitations. Over the long-term (year 2095), this is due to demand that cannot be met from an ever increasing human population on a smaller supply of deer.

The area used by Tenakee Springs residents to harvest 90 percent of their deer would retain sufficient habitat capability to meet all current, local subsistence demand. This area, however, is unable to meet non-subsistence demands under all alternatives, including the no-action alternative. This indicates that there may be a need to restrict non-subsistence harvests of deer in the Tenakee Inlet area on a season-by-season basis.

Issue Area 2 — Fish Habitat and Water Quality

Maintaining stream buffers on all Class I and II streams and many of the Class III streams, along with avoiding Riparian Management Areas, will result in no significant direct, indirect, or cumulative effects on fish or water resources in all of the action alternatives.

Issue Area 3 — Biodiversity and Wildlife

Direct and indirect effects on wildlife habitat acres for Management Indicator Species (MIS) would occur in all action alternatives as a result of timber harvest and road construction reducing wildlife habitat acreage. The estimated habitat loss for Sitka Black-tailed deer ranges from 4 to 7 percent under the action alternatives. Effects were reduced to acceptable levels in all alternatives by maintaining old-growth habitat in non-development land use designations (28 percent of the Project Area is in Old-growth LUD), maintaining 1,000-foot beach and estuary fringes, maintaining buffers on all Class I and II streams, maintaining a minimum of 10 percent canopy structure in all harvest units, and maintaining Riparian Management Areas. In addition, some portions of Timber Production and Modified Landscape LUDs would remain undeveloped, due to oversteepened slopes, unstable soils, and inability to access timber stands.

Since the majority of harvest would occur in old-growth habitat, habitat reductions are proportional to the acres harvested. Alternative F harvests the most acres, and results in the largest reduction. Alternative E harvests the least acres and would reduce old-growth

habitat the least. Reductions in wildlife riparian habitat would also occur in all action alternatives, with Alternative F reducing the most and Alternative E reducing the least.

In the alternatives, limited harvest is proposed within wildlife travel corridors. Wildlife travel corridors within the Project Area are also maintained in the estuary and beach fringe buffers, RMA buffers, and by applying Road Management Objectives. (See connectivity discussions in the Wildlife section of Chapter 4. Also see Appendix D.)

During the TLMP revision planning process, the TLMP team developed a network of old-growth Habitat Conservation Areas (HCAs) to address wildlife population and biodiversity. No harvest units are located in these HCAs for this project.

An analysis of interior old-growth patches was also performed. In all action alternatives, the greatest impact would be the fragmentation of large patches into smaller patches. The action alternatives would result in another decrease of 5 percent or less in the contiguous old-growth acres, across the Northeast Chichagof Island landscape.

In summary, it is unlikely that this project will have a major effect on biodiversity or wildlife species. This conclusion is based on analysis of the effects on habitat acre changes for Management Indicator Species; mitigation measures such as Old-Growth LUDs; and analysis of patch old-growth distribution and size. (See the Wildlife section in Chapter 4.) Cumulatively, none of the alternatives differ significantly.

Issue Area 4 — Log Transfer Facilities and Camp Location

Three log transfer facilities (LTFs) are considered in this project. Alternative B would have two LTFs: a new facility near the mouth of 10-Mile Creek and another at the former Sunny Cove LTF site. Alternatives C and E would reconstruct the former Sunny Cove LTF. Alternative D would use only a new site near the mouth of 10-Mile Creek. Alternative F proposes a new LTF in Sunny Cove (labeled "Sunny Too"), located west of the former site. Use of either Sunny Cove site would impact the East Tenakee Trail. Potential conflicts between pedestrian and logging traffic would occur during timber sale activities, which would normally occur between March and November for three to five years. Mitigation measures have been developed to reduce the potential conflict. (See Appendix C, and the Heritage Resources section in Chapter 4.)

All action alternatives specify that logging camps will be located outside of the Project Area. In Alternatives B, C, E, and F, the timber purchaser would likely locate a logging camp (either a floating or a land based camp) in the Corner Bay area, which is south and across Tenakee Inlet from the Project Area. The location of the floating camp for Alternative D would likely be at Seal Bay, which is across the Inlet from the proposed LTF at 10-Mile Creek.

The proposed camp locations address the issues of noise pollution and disruption of community activities to Tenakee Springs residents. Camp noise impacts would be minimal, if any. However, some noise pollution to Tenakee residents/visitors may be anticipated by any alternative using either of the Sunny Cove LTFs.

Also, with the camps located away from the Project Area, there is less likelihood of competition for deer (the prime source of hunting activities).

Issue Area 5 Economics

Implementation of an action alternative would create opportunities for an estimated 196 to 304 jobs over a four-year period. These jobs would generate approximately $8.4 million (Alternative B) to $13 million (Alternative F) in income. These figures represent both direct and indirect employment and income effects, and were calculated using the IMPLAN economic model. The City of Tenakee Springs would receive income for use of the Sunny Cove tidelands. (Income would be based on volume, user fees, and taxes, in accordance with a Memorandum of Understanding between the Forest Service and Tenakee Springs.)

A decline in recreation/tourism income in Tenakee Springs is likely in all action alternatives proposing an LTF in Sunny Cove. This is due to potential visual and noise disturbances, and the possible lack of access to the Indian River Road during the hunting season. Alternative D, which proposes very little harvesting in the Indian River drainage and no LTF in Sunny Cove, would have the least effect on recreation/tourism income.

For Alternative C, recreation/tourism income would likely return to pre-sale levels following harvest, since the lower drainage of Indian River would not be altered by harvesting. While Alternative B harvests timber throughout the Project Area, potential impacts would be mitigated by emphasizing uneven-aged management. This would allow the area to recover quickly which, in turn, would allow for a more wildland recreation experience and resultant return of recreation/tourism income to pre-sale levels. Under Alternatives E and F, recreation/tourism income would not return to pre-sale levels as quickly as Alternative B, due to their emphasis on clearcut with retention harvest methods.

In all action alternatives, the noise from timber sale activities may decrease the ability of Tenakee Springs businesses and independent guides to provide a wildlands experience for tourists. The noise would impact portions of the Project Area during active timber harvest (March through November for three to five years).

Implementation of any of the alternatives is not expected to have any major direct, indirect, or cumulative impacts on the economics of the local communities and their residents. This is due largely to their dependence on commercial fishing and subsistence, rather than timber, as the primary factors influencing the communities.

Issue Area 6 Social Values

The social values issue has a number of facets. In the following discussion, each identified sub-issue is responded to separately, but many of them are intricately intertwined.

Impacts to East Tenakee Trail Use. Noise originating from either LTF in Sunny Cove could disturb people expecting a wildland experience on the East Tenakee Trail (Alternatives B, C, E, and F). Noise would be from generators and truck traffic, which would be in operation during active timber harvest.

In all action alternatives, trail use could be disrupted during road reconstruction. Alternative D would have the least impact on trail users, because once the heavy equipment has passed through the area, this portion of road would no longer be used. Alternative F would have the largest impact, because the trail would be moved and modified to accommodate construction of the Sunny Too LTF. In all action alternatives, the contractor would be required to maintain clear access to the East Tenakee Trail during sale operations.

Impacts on the City of Tenakee Springs Residents and Visitors. In all action alternatives, the direct effect of noise on Tenakee Springs would probably be minimal. A ridge system lies between the town and the main timber harvest areas. Harvest activities in Alternative D are at least eight miles from Sunny Cove. Under the other action alternatives, harvest activities are at least three to six miles away. The noise, however, may decrease the ability of Tenakee Springs businesses and independent guides to provide a wildlands experience for tourists. The noise would impact portions of the Project Area during active timber harvest.

The Tidelands Memorandum of Understanding between the Forest Service and the City of Tenakee Springs stipulates that helicopters (used for harvest and personnel transport) would only be allowed a certain flight path in the timber sale area except in case of emergency. This provision would confine the helicopter noise to certain designated areas. (See the Mitigation Measures section in Appendix C.)

No alternative should affect the Indian River fish populations. Riparian Management Area prescriptions are expected to prevent any degradation to the aquatic resource. For further information see the Soils, Fish and Water section in Chapter 4.

No reduction in sport deer bag limit or season is expected as a result of this project. For further information, see the Wildlife, Subsistence, and Recreation sections in Chapter 4.

All or most Indian River roads may not be available for recreation use during the sale due to possible conflicts with logging operations and LTF use. Alternative D would have the least impacts because the main Indian River drainage road would be available.

In Alternatives D, E and F, proposed RMOs would close all roads following completion of harvest. This would reduce the Indian River Road System Recreation Place by 81 percent.

Recreation activities by Tenakee Springs residents and tourists would be disrupted to some extent during harvesting. Alternative D would have the least impact; Sunny Cove would only be used to off-load heavy equipment at the beginning of the project, and only one harvest unit would be taken from the Indian River drainage. Alternative F would have the most impact; it has the highest volume to harvest , and would use a LTF in Sunny Cove. Following harvest, recreation activities would take place in a more developed environment.

Impacts to the 10-Mile Creek Area. In Alternatives B and D, there would be noise and visual impacts at the 10-Mile Creek LTF site. Alternative B would have less effect than Alternative D, because less volume is transferred at 10-Mile Creek. Alternatives C, E, and F would not use this LTF site.

Log rafting and transporting may disrupt fishing at the 10-Mile Creek LTF during active timber harvest (three to five years). No saltwater habitat loss is anticipated.

In Alternatives B and D, the 10-Mile Recreation Place experience would change from Semi-Primitive Motorized (SPM) to Roaded Modified (RM). The proposed RMOs for Alternative B would also add the 10-Mile Creek LTF development into the large, maintained Indian River Road System Recreation Place.

Impacts to Karst Resources. No degradation is expected to karst resources during or after harvesting and road building in any of the action alternatives. Recreational use of the resource may be curtailed during active timber harvesting, due to lack of road access.

Impacts to Heritage Resources. The East Tenakee Trail has been determined eligible for inclusion on the National Register of Historic Places. Only Alternative F impacts the trail. A determination of adverse effects has been submitted to the State Historic Preservation Office (SHPO). A detailed mitigation plan would be developed in cooperation with Federal, State, and local governments if this alternative is selected. See the Heritage Resources section in Chapter 4.

Impacts Caused by Logging Camps. Forest Service contractor's compliance with State and Federal laws would address potential pollution problems from the logging camps and timber management activities. Tenakee Springs' concerns have been addressed by locating the camp away from the Project Area. The camp would likely be at Seal Cove in Alternative D, and at Corner Bay in all other action alternatives. (Additional information on logging camps is in the Transportation System section of Chapter 4.)

Impacts to the Sunny Cove Area. Alternative D would have the least impact on recreational use of the Sunny Cove shoreline because the LTF would only be used for mobilization (unloading heavy equipment from barges). Of the alternatives that use a LTF in Sunny Cove, Alternative B has the smallest timber volume and would also be using the 10-Mile Creek LTF. These two factors would limit the disruption of Sunny Cove recreation use. Alternative F would have the highest impact to the non-National Forest shoreline; the new Sunny Too LTF in this alternative would have a much larger visual impact than the former LTF, extending 200 feet into the cove and projecting at least 5 feet higher than the mean-high tide.

Both LTF sites at Sunny Cove could displace private fishing guides for three to five years due to log rafting and transport. No saltwater habitat loss is anticipated.

Impacts to the Overall Recreation Use of the National Forest System land in the Project Area. In all cases, the area would change from a more wild experience to a more developed one. Alternative D would have the least impact on the existing recreation experience, with a 26 percent acreage change in Semi-Primitive Non-Motorized (SPNM) and a one percent acreage change in Semi-Primitive Motorized (SPM). The Roaded Modified (RM) acreage would increase from 20 percent to 47 percent. Alternative F would have the most effect on the existing recreation experience.

During this entry, Alternative F would visually disturb the Project Area landscape the most and Alternative E the least. Alternative D will have the least visual disturbance in the immediate Indian River drainage.

When harvesting is completed, the inventoried recreation opportunities would be RM because of harvest-related disturbance along the road system. In Alternative D, the roads in the Indian River drainage would revert to a Roaded Natural (RN) or SPM experience sooner than the rest of the Project Area because of the lack of new disturbance from this entry.

Considering the cumulative effects of harvest and rehabilitation at LTFs, the Recreation Place recreation opportunity would remain RM until the areas regain the qualities of a Roaded Natural (RN) experience. This would likely occur after approximately five years. Qualities of a Semi-Primitive Motorized (SPM) experience would be regained after approximately ten years.

The existing Recreation Sites (Sunny Cove anchorage, the beaver ponds area, dispersed camp sites in the 10-Mile Creek area, a cave, a trail leading to alpine on the Freshwater/10-Mile Pass) would not be disturbed in any alternative. Access to some sites could be impeded, however, depending upon the proposed RMOs. In Alternatives D, E and F, the proposed RMO would not maintain the road system for recreation traffic. The sites affected would be the cave and the trail.

Issue Area 7 — Alternatives To Traditional Clearcutting

Traditionally, the term "clearcut" refers to the harvest method in which the entire timber stand within a unit is harvested. All clearcuts under this project would retain at least 10 percent of the stand, to comply with standards and guidelines for protection of high value marten habitat and to address other resource concerns. These units would therefore not truly be traditional clearcuts. However, in order to serve as a standard against which to compare alternative harvest methods, these clearcuts with green tree retention are referred to as traditional clearcuts for this project. Alternative B has the smallest number of acres (813) harvested by this method, and Alternative F has the largest number of acres (1,461). (See Table 2-3).

Using ground-based systems (shovel, cable, and tractor logging) for traditional clearcutting has provided the highest economic return. The use of helicopters for non-traditional harvesting (patch clearcuts and group selections) is very costly, and therefore would have a correspondingly lower economic return. Alternative F proposes a higher percentage of clearcut volume than the predominant partial harvest methods in Alternative B. Of the action alternatives, Alternative F would result in the greatest net stumpage value, most jobs, and the greatest increase in regional income.

There are also areas where, due to unstable ground or distance from the nearest road, helicopter logging is currently the only means available. This type of logging is less impactive to nearly all resources; however, to log by helicopter means that future entries into that area will also be by helicopter. (See Table 2-3).

Proposed Harvest Units or Combinations of Harvest Units Over 100 Acres

There are no proposed harvest units or combinations of harvest units that create openings greater than 100 acres in any of the Indian River Project Area alternatives.

Post-harvest Silvicultural Treatments

Reforestation is the process of establishing a new forest on harvested areas. The Forest Service is required by law (NFMA), regulations, and policies to plan timber harvests only on lands where there is assurance that such lands can be regenerated within five years after harvest is completed. Reforestation can be accomplished by natural seeding from surrounding timber stands or by planting. Natural regeneration is the method of choice in Southeast Alaska and usually produces satisfactory results. Where necessary, post-harvest silvicultural treatments will include hand planting and precommercial thinning.

Hand Planting

Hand planting may be necessary or desirable when a natural source of seed for a desired species is inadequate to maintain a timber stand's current species composition, or when it is desirable to reduce the time needed for natural regeneration. The number of acres to be hand planted to maintain species composition can be reasonably estimated before harvest. Table 2-1 displays, by alternative, the potential acres identified for hand planting. Post-harvest restocking surveys will assess the adequacy of natural regeneration and may identify additional areas needing hand planting. (See Appendix C for more information on proposed hand planting.)

Table 2-1
Units Proposed for Hand Planting

Alternatives	Total Acres	Units
B	146	2220, 2310, 2810, 2820, 62720, 63840, 63920
C	209	2810, 2820, 3112, 60420, 62730, 62840, 63110, 63510, 63920, 63960, 63970, 63971, 65013
D	114	60420, 62730, 62840, 63110, 63510, 63920, 63960, 63970, 63971, 65013
E	156	2310, 2340, 3020, 62720, 62730, 62740, 62840, 62850, 63110, 63510, 63920, 63960, 63970, 63971, 65013
F	281	2220, 2310, 2340, 2810, 2820, 3010, 3020, 3112, 60420, 62730, 62840, 63110, 63510, 63920, 63960, 63970, 63971, 65013

Source: Beall 1996.

Precommercial Thinning

Natural regeneration often results in dense stands of trees. Precommercial thinning is used to regulate the growth of young trees for timber production values and wildlife benefits. By thinning tree stands, species composition can be controlled, stand health and vigor improved, wildlife habitat enhanced (trees grow larger more quickly), and windfirmness increased. Precommercial thinning creates more space for the remaining trees to grow, and may increase financial return (Ruth and Harris 1979). Four units (209 acres) have been identified for precommercial thinning. Actual acres thinned may vary as a result of site-specific examinations. Units harvested in this project would be surveyed and evaluated for

precommercial thinning in 20 to 25 years after harvest. Which units to thin would be decided at that time. (See Appendix C for more information on precommercial thinning.)

Precommercial Thinning Surveys

Surveys for precommercial thinning needs are scheduled in the Project Area for areas which have previously been harvested. Table 2-2 displays planned surveys, by VCU and calendar year for which survey is scheduled. Additional acres adjacent to these harvest areas may be considered for riparian thinning projects. These are planned in riparian areas where harvest removed a portion or all of the large trees adjacent to the stream. Riparian thinning may be used in some cases to increase species diversity, and to maintain or enhance wildlife travel corridors. It may also be used to enhance and accelerate tree growth, which would provide future large woody debris input into the stream system.

Table 2-2
Precommercial Thinning Surveys of Previously Harvested Units Within the Project Area

VCU	Total Acres	Calendar Year Survey Scheduled
2160	35	1999
2160	546	2000
2160	10	2001
2220	345	1999

Source: Beall 1996.

Enhancement Opportunities

Sale Area Improvement

The Knutson-Vandenberg Act of 1930 (K-V), as amended by the NFMA of 1976, allows the Forest Service to collect receipts from timber sales for Sale Area Improvement (SAI) projects. Top priority for these funds is to ensure stand regeneration. Both the Sitka and Hoonah District Rangers will prioritize subsequent projects (e.g., precommercial thinning, fisheries enhancement, wildlife rehabilitation, and soil stabilization) and list them on the SAI plan. Separate NEPA analyses will be done for these projects as required. If funding for resource enhancement projects is not available from K-V receipts, these projects could be added to the regular program budget. Both Ranger Districts will develop the SAI plan after the ROD is signed.

Recreation and Fisheries

The following were identified during project scoping as recreation and fisheries enhancement projects:

- Build more trails accessible from Tenakee Springs in VCUs 2200, 2210, and 2220. (Sitka Ranger District Recreation scoping, 1994.)
- Build a Forest Service cabin six to eight miles from saltwater along Indian River Road, for overnight cross-country skiing and hunting trips in VCUs 2160, 2200, and 2220. (Indian River Timber Sale public scoping, 1996).
- Continue with Forest Service proposed coho salmon stocking in the Indian River. (Forest Service proposed project.)
- Construct a fishpass to open up an additional 8 to 10 miles of Indian River main-channel stream to coho salmon. (Forest Service proposed project.)
- Build a loop trail for hiking and cross-country skiing: Use the Indian River Road to the meadow area; build a new section over the ridge behind Tenakee Springs; end the trail at the community of Tenakee Springs, in VCU 2200. (Indian River Timber Sale public scoping, 1996).

Mitigation Measures

Mitigation measures were considered and identified during the planning phase of this project. Standards, guidelines, and direction from the 1997 TLMP, the Alaska Regional Guide, and applicable Forest Service manuals and handbooks were applied in alternative development, unit boundary design, and road corridor locations for all alternatives. A brief summary of mitigation measures common to all alternatives is included in Appendix C. (Note: Analyses of project effects in Chapter 4 also include discussion of mitigation measures specific to each resource.)

Specific mitigation measures were identified that reduce or eliminate adverse effects. These measures, as applied to each harvest unit and road, are identified on the respective unit and road cards. Unit Cards are included in Appendix J, and Road Cards are in Appendix I. These cards list design considerations and provide an important mechanism for tracking project implementation.

Monitoring

Monitoring is designed to determine if standards and guidelines, and resource management objectives of the Indian River Project have been met. The results are used to verify the timely implementation and effectiveness of selected mitigation and protection measures. Regardless of which alternative is selected, monitoring activities will be conducted over the course of the project. Three types of monitoring (implementation, effectiveness, and validation) were recognized in the development of the monitoring plan. The plan is fully described in Appendix C.

Implementation monitoring assesses whether a project was implemented as designed and whether or not it complies with the TLMP. Effectiveness monitoring examines the effectiveness of the project's design, including unit layouts, road location, and mitigation measures intended to preserve natural resources and their beneficial uses. Each activity is monitored separately, and the resulting data is analyzed and reported by the Forest Service. Validation monitoring is conducted at the Regional level in conjunction with research and is identified in the Forest or Regional planning process (TLMP).

Identification of the Forest Service Preferred Alternative

The Forest Service has identified Alternative C as the Preferred Alternative. All of the alternatives will be examined before preparation of a Final EIS. Public comments will be taken into consideration, as well as additional information and analysis. Comments on the Preferred Alternative and the other alternatives in this Draft EIS will be most useful if they focus on particular aspects of the alternatives that the reviewer either likes or dislikes. The final selected alternative may be the same as the Preferred Alternative, or a modified version, or an entirely different alternative.

Table 2-3
Summary Comparison of Planned Actions, by Alternative

	Alt. B Proposed Action	Alt. C	Alt. D	Alt. E	Alt. F
Volume, Acres, and Units					
Sawlog Volume (mbf)	19,051	22,969	19,222	19,602	29,505
Sawlog and Utility Volume (mbf)	23,814	28,711	24,027	24,502	36,881
Harvested Acres	1,885	1,856	1,586	1,665	2,355
Number of Harvest Units	85	82	71	78	106
Logging Systems by Acres					
Cable	327	655	514	546	687
Cable/Helicopter*	63	121	58	89	121
Helicopter	1,467	990	930	975	1,410
Shovel	28	90	84	55	137
Logging Systems by Volume (mbf)					
Cable	5,302	11,723	9,442	9,564	12,896
Cable/Helicopter*	1,198	2,212	1,014	1,709	1,939
Helicopter	16,932	13,128	11,962	12,149	19,451
Shovel	382	1,648	1,609	1,080	2,595
Harvest Method by Acres					
Clearcut w/Green Tree Retention	813	1,173	992	1,115	1,461
Overstory Removal	325	186	151	159	244
Patch Clearcut	118	167	120	85	326
Group Selection	569	150	160	131	95
Single Tree Selection	60	180	163	175	224
Harvest Method by Volume (mbf)					
Clearcut w/Green Tree Retention	15,831	22,905	19,189	20,078	28,173
Overstory Removal	4,139	2,435	1,905	2,178	4,048
Patch Clearcut	820	1,435	1,047	433	2,297
Group Selection	2,409	538	596	505	381
Single Tree Selection	615	1,398	1,290	1,308	1,982
Roads and Log Transfer Facilities					
New Road Miles	7.8	9.5	9.2	8.4	9.7
Reconstructed Miles	21.6	21.7	10.7	21.6	22.1
Temporary Road Miles	1.9	3.1	2.4	2.6	3.5
Number of LTFs	2	1	1	1	1
Bridges					
Number of Existing Bridges Replaced	22	22	15	22	22
Number of New Bridges	7	7	6	7	7
Log Transfer Facilities Location					
Sunny Cove	1	1	0	1	0
Sunny Too	0	0	0	0	1
10-Mile Creek	1	0	1	0	0
Camp Location					
Corner Bay - land-based camp	0	0	0	1	0
Corner Bay - float camp	1	1	0	0	1
Seal Bay - float camp	1	0	1	0	0
Post Harvest Road Management Objectives					
Mainline Roads Open	Yes	Yes **	--	Yes **	Yes **
Close All Roads	--	--	Yes	--	--
Timber Economics					
Annual Direct/Indirect No. of Jobs (over 4 yrs.)	49	59	49	50	76
Annual Average Wages -$ millions (over 4 yrs)	$2.1	$2.5	$2.1	$2.2	$3.3

* Most of unit is cable, but one or more settings are helicopter.

** Open to administrative traffic only.

Table 2-4
Summary Comparison: Effect on Resources, by Alternative

	Alt. A Existing Condition[1]	Alt. B Proposed Action	Alt. C	Alt. D	Alt. E	Alt. F
Old-Growth % Remaining	86.6	79.6	78.7	79.7	79.1	76.2
Old-Growth Acres Remaining						
Alpine/Subalpine	539	537	537	537	537	537
Brushfields	2,144	2,115	2,106	2,107	2,061	2,098
Colluvial/Fluvial/Coastal	2,234	2,071	1,978	1,971	2,043	1,935
Forested Hills	306	281	281	281	281	281
Lowland Wetland-Forest	1,132	1,123	1,117	1,121	1,110	1,114
Moderately Steep Forested Slopes	3,840	3,476	3,444	3,626	3,453	3,298
Steep Forested Slopes	5,873	5,165	5,130	5,141	5,184	4,867
Wetlands Acres Affected						
% Affected in Harvest Units	0.5	2.0	1.6	1.3	1.9	2.7
% Affected by Roads	0.5	0.7	0.8	0.8	0.8	0.8
Wildlife Habitats: % of Habitat Affected						
Beach Fringe	-21	-22	-21	-22	-21	-21
Estuary Fringe	-2	-2	-2	-2	-2	-2
Riparian	-30	-36	-37	-37	-34	-38
Old-Growth	-10	-20	-20	-18	-18	-22
Second-Growth	+1,230	+2,519	+2,486	+2,304	+2,209	+2,814
Alpine/Subalpine	0	0	0	0	0	0
Wildlife Habitat						
% Change in Suitable Habitat						
Sitka Black-tailed Deer	-10	-15	-16	-15	-14	-17
Brown Bear	-6	-10	-10	-10	-9	-11
River Otter	-32	-39	-40	-40	-37	-41
Marten	-13	-20	-21	-20	-20	-24
Red Squirrel	-8	-17	-17	-15	-15	-19
Brown Creeper	-23	-36	-35	-33	-32	-39
Red Breasted Sapsucker	-10	-23	-23	-21	-20	-26
Hairy Woodpecker	-17	-33	-32	-29	-29	-37
Bald Eagle	-37	-45	-46	-46	-43	-48
Recreation Opportunity Spectrum						
% of Acreage on National Forest Lands						
Semi-Primitive Non-Motorized	79	49	50	53	51	46
Semi-Primitive Motorized	1	0	1	0	1	1
Roaded Modified	20	51	49	47	48	53
Fish/Water Quality						
Total Road Miles in Stream Buffers	6.6	7.4	7.7	7.7	7.6	7.8
Number of Stream Crossings						
Class I/II	88	110	118	116	116	119
Class III	13	19	24	22	24	25
Total	101	129	142	138	140	144
Heritage Resources						
Impacts on Historic Property	No	No	No	No	No	Yes

[1] Alternative A reflects action taken from 1956 through 1996.

Table 2-4 continued
Summary Comparison: Effect on Resources, by Alternative

	Alt. A Existing Condition[1]	Alt. B Proposed Action	Alt. C	Alt. D	Alt. E	Alt. F
Subsistence Effects: Project and (Cumulative) Effects	Significant Possibility of a Significant Restriction of Subsistence Use					
Abundance or Distribution:						
Deer	No (Yes)[2]	No (Yes)	No (Yes)	No (Yes)	No (Yes)	No (Yes)
Brown Bear	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Furbearers	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Fish Resources	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Other Resources	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Competition:						
Deer	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Brown Bear	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Furbearers	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Fish Resources	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Other Resources	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Access:						
Deer	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Brown Bear	No (Yes)	No (Yes)	No (Yes)	No (Yes)	No (Yes)	No (Yes)
Furbearers	No (Yes)	No (Yes)	No (Yes)	No (Yes)	No (Yes)	No (Yes)
Fish Resources	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)
Other Resources	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)

[1] Alternative A reflects action taken from 1956 through 1996.
[2] Each column displays both project and (cumulative) potential for restrictions of subsistence use.

Chapter 3

Affected Environment

Chapter 3

Affected Environment

Overview

This chapter documents the existing condition of resources within the Indian River Project Area that may be affected by the proposed project actions. This information is used as the baseline for measuring the effects of the alternatives discussed in Chapter 4.

In 1996, the Forest Service completed a watershed analysis report summarizing the findings of the Indian River Watershed Analysis (IRWA). The report described the natural resource condition, human features, processes, and interactions for the Indian River area. While the specific purpose of the analysis was to gather pertinent information helpful in addressing the issues of watershed protection, riparian conservation, and maintenance of fish habitat capability, much of the data is pertinent to this EIS as well. The boundaries of the watershed analysis area closely approximate the boundaries of the Project Area. In certain resource discussions (for example, soils, water, and fish), the terms "watershed analysis area" and "Project Area" are used interchangeably. Information in this chapter taken from the IRWA is cited as *Paustian et al. 1996*.

Geophysical

The Indian River Project Area is located on Chichagof Island (1,436,463 acres), one of the larger islands of the Alexander Archipelago, in Southeast Alaska. Chichagof Island is 64 miles long and 60 miles wide. It is bounded on the west by the Pacific Ocean, on the north by Cross Sound and Icy Strait, on the east by Chatham Strait, and on the south by Peril Strait.

Climate

The Project Area lies in the Southeast Alaska maritime climate region. Mean annual temperature is 40°F. A climate station on the outer coast of Chichagof Island receives 113 inches of precipitation annually, while Angoon on the west coast of Admiralty Island receives an average of 38 inches (Farr and Hard 1987). All the measuring stations are very close to saltwater and less than 50 feet in elevation. Precipitation at higher elevations further inland varies considerably (Farr and Hard 1987). Precipitation occurs throughout the year. Annual precipitation averaged 106 inches between 1976 and 1980 at a monitoring station located near the middle of the Indian River watershed.

Most snowfall occurs between December and March. Snowfall is highly variable in amount and persistence from year to year, especially at low elevations along the coastline. During mild winters, coastal low elevation areas may remain snow free (Martin et al. 1995).

The growing season (number of days with minimum temperature above 32°F and maximum temperature above 40°F) averages 186 days at the Sitka Airport. Average maximum temperatures during the summer growing season range from 55°F to 66°F. Daylight varies from 7 hours during the winter to about 18.5 hours during the summer. Summer daily temperature fluctuations are reduced due to long day lengths and cloud cover. Daily winter fluctuations are moderated by low sun angle and cloud cover (Martin et al. 1995).

Prominent low pressure systems cause frequent fall and winter storms which often result in blowdown of forest stands. Prevailing wind direction is strongly influenced by local topography (Martin et al. 1995).

Landscape Ecology

Landscape Analysis

The National Environmental Policy Act (NEPA) requires that areas outside the Project Area boundary which may be indirectly impacted by the project actions be included in the project environmental analysis, in addition to those areas which would be directly impacted. For the Indian River Project, this was accomplished with a landscape analysis completed for Northeast Chichagof Island (Garvey et al, in prep.).

The Northeast Chichagof landscape analysis area (which includes the Indian River Project Area) is an ecological entity, consisting of that portion of Chichagof Island bounded on the north by Icy Straight, on the east by Chatham Strait, on the south by Tenakee Inlet, and on the west by Port Frederick. A narrow strip of land between the northwest end of Tenakee Inlet and the southern tip of Port Frederick connects it to the remaining portions of Chichagof Island. Although most of the analysis was confined to this portion of the island, linkages to the whole island are recognized, particularly with respect to population viability.

Landscape analysis assumes resource integration, emphasizing the relationships and linkages among resources. This approach focuses on processes, community structure, and composition, and views these from scales larger than the Project Area. It also applies a broad look over time, incorporating historic and future perspectives. This type of analysis over space and through time is necessary to address landscape issues such as biological diversity, forest fragmentation, and maintenance of viable wildlife populations.

The analysis is based on the following central features of ecosystem management:

- Integration of resources rather than considering them separately.
- Use of a systems framework, emphasizing the relationships between community, composition, structure and function.
- Viewing ecosystem composition, structure and function in a hierarchy of spatial and temporal scales in order to address biodiversity within habitats, between habitats, and between geographic areas (see Table 3-1).
- Developing Desired Future Conditions at multiple scales that take into consideration economic feasibility and the health, productivity, and resilience of the land over time in the face of unplanned and uncertain future events.

Forest ecosystems are neither discrete nor easily delineated. Ecosystems can be conceptualized as occurring in a nested geographic arrangement, with smaller ecosystems contained within larger ones (Haber 1994, Bailey 1996). Table 3-1 displays this wide range of ecological units, from global or continental geographic areas down to relatively small areas such as the Indian River Project Area. In the past, the focus was primarily on the landtype and landtype phase levels; for the Northeast Chichagof landscape analysis, the focus is the subsection and landtype association levels. (See Appendix H and Landtype association discussions on page 5 of this chapter for further explanation of concepts and terminology.)

Biodiversity

Biodiversity, an abbreviation of biological diversity, is defined as the variety of life and its processes, including the variety in genes, species, ecosystems, and the ecological processes that connect everything in ecosystems (Bourgeron et al. 1994). The Northeast Chichagof Landscape inventory includes a biological diversity assessment of the landscape area. Such an assessment can be discussed from either a species (*fine filter*) approach or ecosystem (*coarse filter*) approach. The species approach works well where the aim is to aid a known species whose survival is threatened. The ecosystem approach works well

where there is inadequate knowledge about numbers and kinds of species and relationships among them in an ecosystem; it assumes that the best approach for conserving the species is to ensure that the ecosystem continues to have the same overall composition, structure, and function (Walker 1995). In this biodiversity assessment, both approaches were used.

Coarse Filter

To preserve ecosystem variety, the ecosystems must first be classified and mapped, so that type and extent are known. However, these tasks are difficult since ecosystems are intricate systems and can be recognized at various scales. Also, not all ecosystems are equally susceptible to human-induced change. For Northeast Chichagof, the following three types of coarse filter diversity were assessed:

Landscape diversity. Landtype associations that make up the watersheds of the analysis area are of different distributions and have been affected differently by natural and human disturbance. The landtype associations were mapped and compared among watersheds and with past harvest activity.

Structural diversity. Natural disturbance agents such as wind, disease, and landslides increase the canopy heterogeneity and age cohorts across the forested landscape. Human and natural disturbances lead to forest fragmentation, which is a concern for wildlife species (see natural disturbance discussion in the Vegetation and Wildlife sections).

Geologic Diversity. Limestone distribution and structure in this temperate humid environment create karst, which may contain cave features (both abiotic and biotic) that are uncommon or rare. With Forest Service cooperation, the USGS geology map was updated and digitized into GIS to aid in locating potential karst areas within the analysis area (see Geology, Minerals and Caves).

Table 3-1
National Hierarchy of Ecological Units

Planning and Analysis Scale	Ecological Units	Purpose, Objective, and General Use	General Size Range	Land Area used in this Project
Ecoregion Global Continental Regional	 Domain Division Province	Broad applicability for modeling and sampling. Strategic planning and assessment. International planning.	1,000,000's to 10,000's of square miles	Not Applicable
Subregion	Section ---- Subsection	Strategic, multi-forest, state-wide and multi-agency analysis and assessment	1,000's to 10's of square miles	Region 10 wide ---- Tongass/Chatham wide
Landscape	Landtype Association	Forest or Area-wide planning, and watershed analysis	1000's to 100's of acres	Northeast Chichagof scale
Land Unit	Landtype Landtype Phase	Project and Management Area planning and analysis.	100's to less than 10 acres	Project level (for example, timber sales)

Source: USDA Forest Service 1993

Fine Filter

A fine filter approach was used for the following known species or communities: (Other diversity concerns not addressed here include nonvascular plants, invertebrates and genetic diversity.)

Plant community diversity. Forested stands with an abundance of regenerating yellowcedar and rich calcareous fens are communities that are rare in Southeast Alaska. Hence, one cedar stand that is considered unique in the upper portion of Freshwater drainage was eliminated from consideration for timber harvest. Rich fens, one of the rarest wetland types in the Alexander Archipelago, were mapped, to facilitate avoidance in future roading (see Vegetation section).

Threatened, endangered, or sensitive species. Known species of reduced numbers or limited distribution (both plant and animal) were considered individually. When appropriate, surveys were completed (see Wildlife and Threatened, Endangered, and Sensitive Species sections).

Salmon stock diversity. Maintenance of diverse salmon stocks is a primary concern to ensure the survival of the individual stocks throughout their range and sustainable salmon production. Hence, riparian buffers are identified to protect important habitat (see Soils, Fish and Water section).

Plant species diversity. Species diversity is often measured as the number of species per a given area, and numbers are compared among different areas. For the analysis area, species observed in past sampling have been tallied.

Because individual species tallies are difficult to conduct in a large area, data is not available which would support a complete listing of species for the analysis area or for the larger Northeast Chichagof area. Those species that may be at risk are discussed in the Threatened, Endangered, and Sensitive Species section of this report. (See Appendix H for a partial listing of individual plant species in the landscape analysis area.)

Number of species varies by plant association; the greater number is generally found in the more open overstory types. Since individual species cannot be tallied, the coarse filter approach is used in an attempt to conserve a diversity of habitats. For more information on species and plant communities on the Chatham Area, refer to Martin et al. 1995.

Landscape Diversity

There are 19 subsections on the Chatham Area (Brock et al. In prep.). Within the Alexander Archipelago section in Southeast Alaska, the delineating criteria for subsections are: gross topography, bedrock geology, sub-regional climate, glacial geology, general soil classifications, and potential natural vegetation.

The Northeast Chichagof subsection (from Lemesurier Island in Icy Strait south to approximately Sitkoh Bay) was delineated from the rest of Chichagof Island based on geology. This subsection is almost completely divided into three parts by bays and inlets. Northeast Chichagof is made up of the central portion of this subsection (see Figure 3-1). This part of Chichagof Island is on the Alexander terrane and contains more calcareous rock than other parts of the island. This area is also drier and cooler than the west side of the Archipelago. The ECOMAP classification (ECOMAP 1993) for the northeast Chichagof inventory area at the subsection level is as follows:

Domain:	Humid Temperate
Division:	Marine
Province:	Pacific Gulf Coast Forest
Section:	Alexander Archipelago
Subsection:	Northeast Chichagof

Landtype Associations

Landscape diversity relates to the abundance of different landtype associations (LTAs). LTAs are delineated based on similarities in geomorphic processes, soil complexes, stream types, wetlands, and plant associations (ECOMAP 1993). (See the Vegetation section in this chapter for a brief description, and Appendix H for a full discussion of landtype associations.)

The watersheds that make up the Project Area have different amounts and distributions of landtype associations (Figure 3-2). The dominant LTAs are the alpine/subalpine summits and ridges, brushfields, steep forested mountain slopes, and moderately steep forested mountain slopes.

The most productive forest occurs in four landtype associations: steep forested mountain slopes, moderately steep forested mountain slopes, the colluvial/fluvial/coastal surfaces, and forested hills. The lowland wetland-forest complex and the brushfield LTAs are marginal for trees because of factors such as too much soil moisture, low soil temperature and too much avalanching. The remaining two landtype associations, alpine/subalpine summits and ridges and estuaries/beaches, primarily comprise non-forested communities in the Project Area (Table 3-1a).

In general, most of the higher elevation and steeper LTAs are quite abundant, while the flatter, lower elevation LTAs are less common. The estuaries/beaches LTA is the least common. Both the estuaries/beaches and colluvial/fluvial/coastal surfaces LTAs have been affected by timber harvest in the past. Log transfer facilities have often been on or adjacent to estuaries, and alluvial fans and flood plains have been heavily harvested because they are productive for timber and easily accessible.

Landscape diversity may be compared between the Indian River Project area and Northeast Chichagof for a larger scale perspective. Table 3-1a compares the acres and percentages of each LTA in the Indian River area and in Northeast Chichagof as a whole. All of the LTAs are present in both areas.

Table 3-1a
Landtype Association Acres and Percentages for the Indian River Project Area and the Northeast Chichagof Landscape Analysis Area

Landtype Association	Indian River Project Area		NE Chichagof Landscape Area	
	Acres	Percent	Acres	Percent
Alpine/Subalpine Summits and Ridges	8,225	21%	42,746	17%
Brushfields	8,795	22%	33,247	14%
Steep Forested Mountain Slopes	7,592	19%	45,121	19%
Moderately Steep Forested Mountain Slopes	6,041	15%	45,121	19%
Forested Hills	1,474	4%	11,874	5%
Colluvial/Fluvial/Coastal Surfaces	4,444	11%	18,998	8%
Lowland Wetland-Forest Complex	2,401	6%	35,622	15%
Estuaries/Beaches	298	1%	4,750	2%
Total	39,270	100%	237,478	100%

Source: Trull et al. 1997

Figure 3-1 ECOMAP Subsections for Chichagof Island

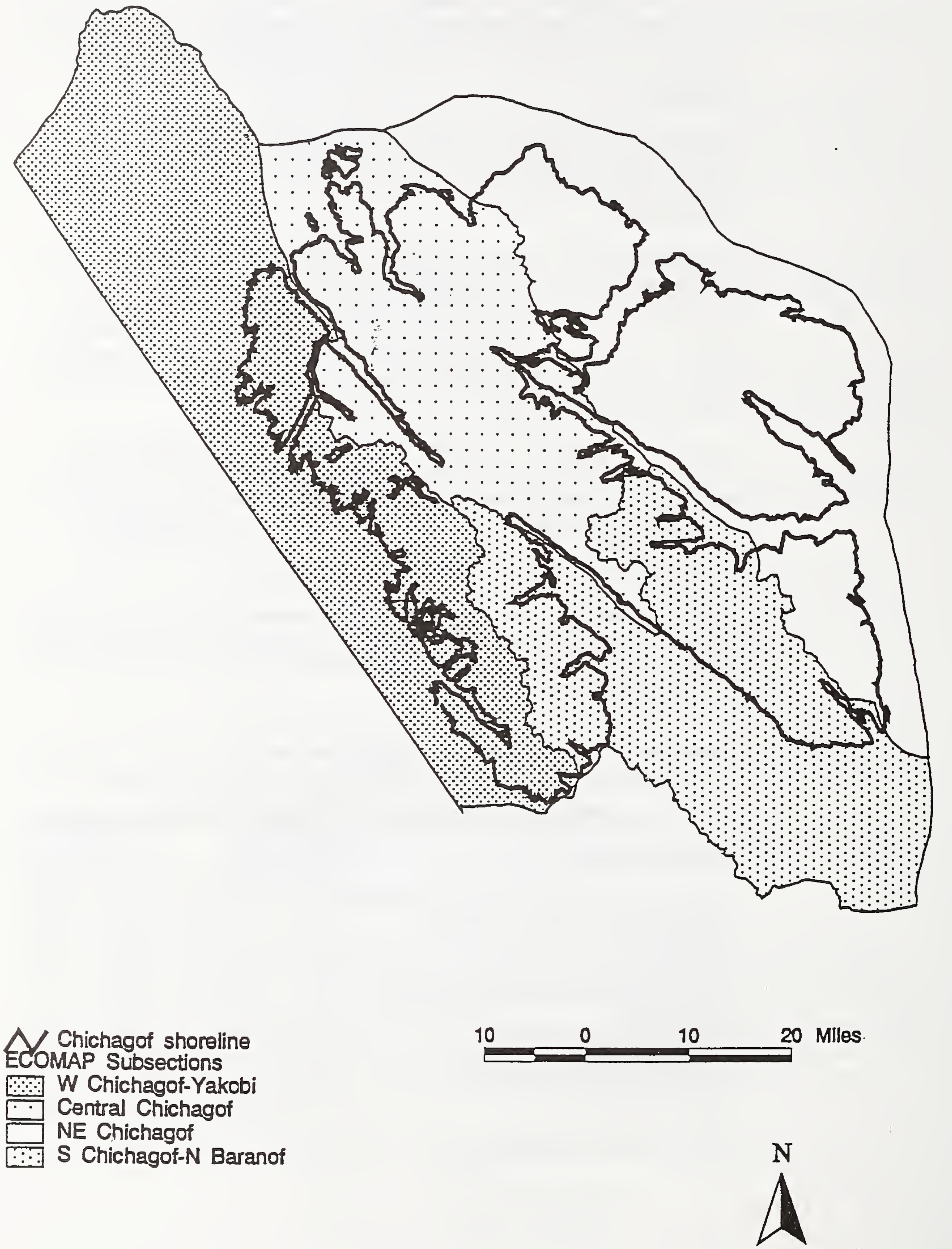
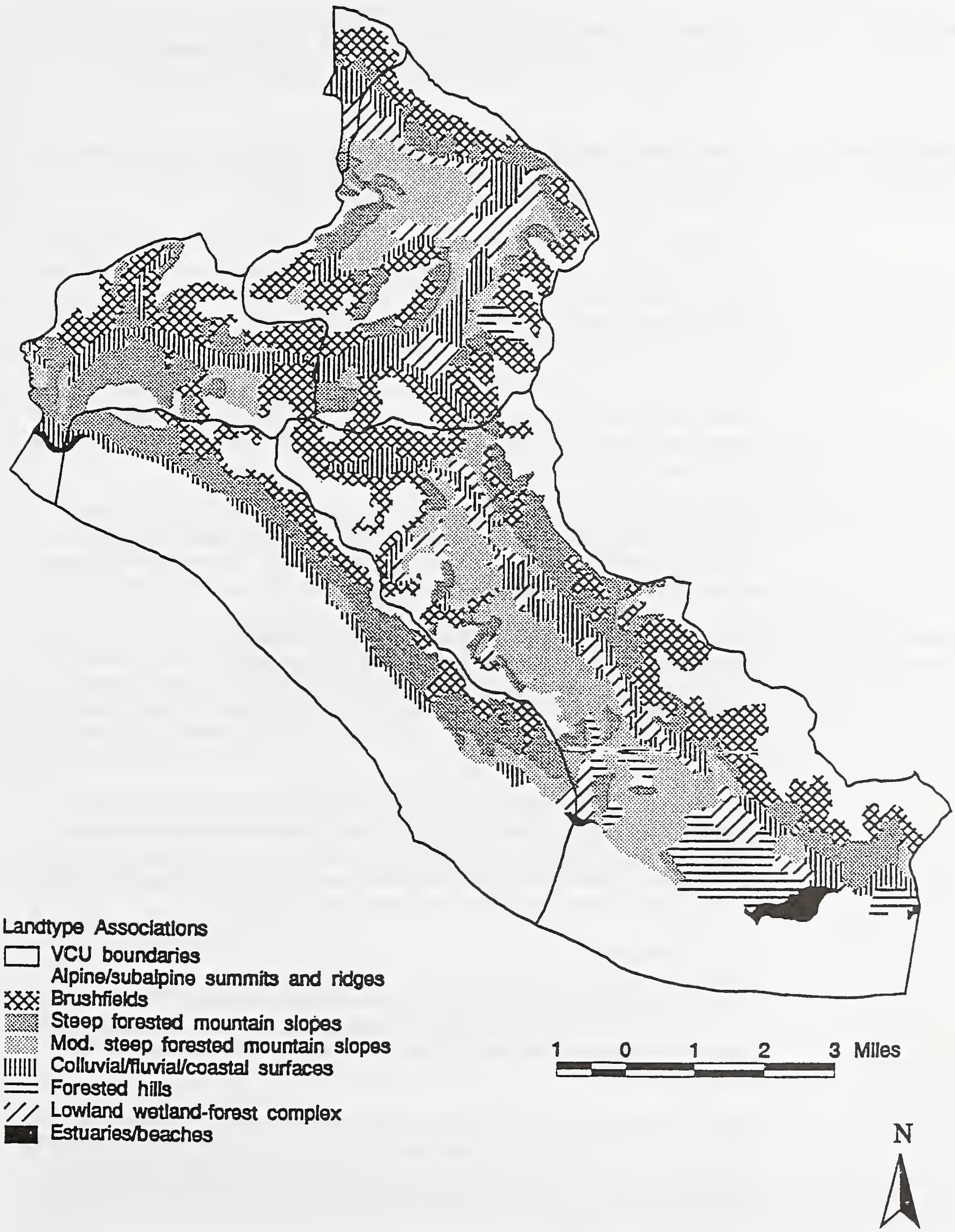


Figure 3-2 Landtype Associations of the Indian River Analysis Area



Geology, Minerals, and Caves

Geology

Southeast Alaska is comprised of three major metamorphic rock complexes. The Indian River Project Area is entirely in the Glacier Bay-Chichagof plutonic-metamorphic complex. Major northwest trending faults define Tenakee Inlet, Indian River, and Freshwater Bay.

Mining/Mineral Potential

Mineral resources are legally divided into three categories: locatable minerals, leasable minerals, and salable minerals. Forest Service authority to manage and regulate activities associated with each type of mineral varies with each category.

Locatable minerals are identified under the United States Mining laws (as amended), and include minerals such as gold, silver, lead, zinc, and molybdenum. The Project Area does not have an active mining history. Bureau of Land Management records show that no active mining claims are located within the area. A potential exists in the area for skarn-type mineral deposits associated with granitic intrusions in carbonate rocks (Karl 1995).

Leasable minerals include Federally owned oil, gas, potassium, coal, phosphate, sulfur, hot springs, and hardrock minerals. There are no known leasable minerals on National Forest System land in the Project Area. Eighteen hot springs are located within the Project Area; however, none are located on National Forest System land.

Salable minerals, also known as common variety minerals, include deposits of sand, gravel, rock, stone, clay, and other similar materials. There are numerous deposits that could be developed within the Project Area for common uses. The primary use of these minerals in the past has been for road and facility construction associated with timber sales.

Caves

The Federal Cave Resources Protection Act of 1988 (FCRPA) defines a cave as: "any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or man-made. Such term shall include any natural pit, sinkhole, or other feature which is an extension of the entrance."

The FCRPA requires that significant caves located on Federal lands be preserved and protected for the perpetual use, enjoyment, and benefit of all people. One cave in the Indian River Project Area is being evaluated for determination of significance. Because this cave may be found to be significant in the future, information concerning its specific location will not be made available to the public (36 CFR, Part 290).

Karst Vulnerability

Cave resources generally occur in areas of karst topography/limestones. Karst is a comprehensive term that applies to the unique topography, surface and subsurface drainage systems, and subsurface landforms that can develop in areas of soluble rock such as limestone or marble.

Karst landscapes support unique ecosystems that include: mature, well developed spruce and hemlock forests along valley floors and lower slopes, increased productivity for plant and animal communities, well developed subsurface drainage, and the underlying unique cave resources (TLMP, USDA Forest Service 1997). Karst landscapes are managed as an ecological unit to protect cave resources.

The 1997 TLMP includes Forest-wide standards and guidelines for the management of karst resources. These include a requirement that karst resources be evaluated as to their vulnerability or sensitivity to land uses affecting karst systems. The Forest Service contracted a geology consultant, Harza Northwest, Inc., to conduct an inventory of karst resources on the Indian River Project Area, and to assess the vulnerability of these resources relative to the affects of timber harvest and related activities (Harza Northwest, Inc. 1996).

Karst vulnerability is determined by a process referred to as vulnerability mapping. The process is similar to hazard area mapping, or risk assessment. It is based on the fact that some parts of a karst landscape are potentially subject to greater resource damage and groundwater contamination risk than other karstlands. Criteria used to define critical areas are: geology, elevation, slopes, karst development, and hydrology.

Three classifications are used in the vulnerability analysis: low, moderate, and high. The 1997 TLMP provides specific karst management objectives and appropriate land uses for each classification. Areas of high vulnerability are those that have the highest resource value and that are most sensitive to adverse impacts from management activities. Karst lands found to be of high vulnerability are removed from the commercial forest lands suitable land base.

Vulnerability Assessment Findings. The assessment by Harza Northwest, Inc. showed that karst development in the Project Area is mostly low to moderate below the subalpine, and moderate to high above the subalpine. Well developed karst features are best exposed in alpine areas above 1,800 feet, where erosive and depositional effects of glaciation have had the least effect. This is above the upper limit of most commercial forest land.

The final vulnerability analysis identifies 13,018 acres of karstland on National Forest land within the Project Area. Excluding upland, non-carbonate contributing watersheds, approximately 269 acres of this karst are classified as low vulnerability, 4,604 acres are classified as moderate vulnerability, and 5,051 acres are classified as high vulnerability. Within the high vulnerability classification, approximately 4,102 acres (81 percent) are located in the alpine and subalpine zones at elevations greater than 1,800 feet.

Table 3-2
Karst Vulnerability in the Indian River Project Area as Assessed by Harza Northwest, Inc. (Acres)

	Low Karst Vulnerability	Medium Karst Vulnerability	High Karst Vulnerability	Total Acreage
Total Acreage within the Harza Northwest, Inc. Contract Area				45,583
Areas underlain by limestone and marble*				11,092
Total vulnerability excluding private lands	269	6,520	6,229	13,018
Total vulnerability excluding private lands and upland contributing watersheds	269	4,604	5,051	9,924
Total vulnerability excluding private lands, upland contributing watersheds, and elevation >1,800 feet	269	4,604	949	5,822

Source: Harza Northwest, Inc. 1996

* The 1997 TLMP standards and guidelines direct that all lands underlain by carbonate rocks within the Forest should be considered a karst landscape. The recommended vulnerability mapping applies only to carbonate rock areas and areas that contribute waters to such areas.

Soils, Fish and Water

Soils

Soils in the Project Area are found on a variety of terrains shaped by glaciation and characterized by mountains and U-shaped valleys. Generally shallow soils have formed in bedrock on the mountain and hill slopes. Glacial till of variable thickness occurs along the hill slopes to an elevation of about 1,000 feet above sea level. In the valley bottoms, soils have formed in riverine deposits, glacial outwash, and marine sediments. The cool, wet climate in the area causes organic matter to decompose slowly, creating soils characterized by organic surface layers.

Limestone occurs in a significant portion of the Project Area, and influences the soils formed in it. These soils are typically not very acidic, high in nutrients and, therefore, quite productive.

Landslides

In geologic time scales, tectonic and glacial processes have probably exerted the most profound effect on the topography and soils of the Project Area. Since the Wisconsin glaciation (ending 12,000 years ago), however, erosion has also been a major factor. Many colluvial and alluvial fans were deposited on the valley floors during this time. This process is continuing, as suggested by current landsliding within the area.

A landslide inventory completed in 1996 shows the distribution, type, and frequency of landslides. The inventory includes all debris avalanches and debris flows greater than 0.5 acres (Paustian et al. 1996).

Table 3-3 displays the number and acres of landslides in each watershed in the Project Area. According to the inventory, 86 percent of the landslide acres occur in alpine areas, while 14 percent occur in forested areas. The slides in alpine areas are more frequent and, on average, larger.

Table 3-3
Number and Acres of Landslides in Project Area Watersheds

	Number of Landslides			Acres of Landslides		
Watershed	Alpine	Forested	Total	Alpine	Forested	Total
Game Creek	0	0	0	0.0	0.0	0.0
Indian River	19	10	29	35.2	5.6	40.8
Freshwater Creek	16	8	24	25.4	6.4	31.8
10-Mile Creek	10	7	17	20.4	0.9	21.3
Total	45	25	70	81.0	12.9	93.9

Source: Paustian et al. 1996.

Table 3-4 further breaks down the frequency of landslides occurring on forested land by past management activities (clearcut versus uncut), for each watershed. While no slides have occurred in existing clearcuts in the Indian River watershed, several have occurred in the 10-Mile and Upper Freshwater watersheds. Within the forested areas of these two watersheds, only 27 percent of the slides occur in uncut areas while 73 percent occur in clearcut areas. However, 88 percent of the acres of slides in forested areas occur in the uncut areas while only 12 percent occur in the clearcut areas. This indicates that slides in clearcuts are more frequent, but smaller than slides in uncut areas.

This agrees with the study by Swanston and Marion (1991) which found that the rate of landslides in clearcuts in Southeast Alaska increased by 3.5 times, but that the slides, on average, were smaller. All the slides in clearcuts have occurred high in existing units or on extremely steep slopes. All but two of these slides have occurred in sediment source areas (see Glossary) or along Class III drainages (Paustian et al. 1996).

Table 3-4
Number and Acres of Landslides in Project Area Watersheds in Forested Uncut Versus Forested Clearcut Areas

Watershed	Number of Landslides			Acres of Landslides		
	Forested uncut	Forested clearcut	Total	Forested uncut	Forested clearcut	Total
Game Creek	0	0	0	0.0	0.0	0.0
Indian River	10	0	10	5.6	0.0	5.6
Freshwater Creek	3	5	8	6.2	0.3	6.4
10-Mile Creek	1	6	7	0.2	0.6	0.9
Total	14	11	25	12.0	0.9	12.9

Source: Paustian et al. 1996.

Sediment Production from Landslides

Alpine slides are the dominant source of sediment in the Project Area watersheds. The highest concentration of large landslides occurs in the divide between the Freshwater Creek and 10-Mile Creek watersheds, where extremely steep alpine summits and soft, low grade metamorphic rock create unstable conditions. Because the bedrock is soft, these slides are deep and produce large volumes of sediment. In addition, most of the alpine landslides begin in the upper ends or along the sides of headwater stream channels, where sediment can be transported to main stem channels.

All of the slides in clearcuts in the 10-Mile Creek watershed reach intermittent streams. However, very little of the resulting sediment reaches main stem channels. Either the intermittent channel does not have enough energy to move the sediment, or the road prism has trapped it. In the Freshwater Creek watershed, a similar situation exists. Of the five slides in clearcuts, three reach ephemeral drainages, but nearly all the sediment remains in the channel or stored behind the road prism. Little sediment filtering capacity remains in some of these drainages. Sediment from additional failures could reach the main stem channels.

Surface Erosion

Forest roads are the primary source of surface erosion not associated with areas bared by landslides. Surface erosion from roadbeds, drainage ditches, and cut- and fill-slopes can be a major source of sediment delivered to streams (Paustian et al. 1996). Table 3-5 shows road density and drainage structures in each watershed in the Project Area.

Table 3-5
Existing Roads and Numbers of Drainage Structures by Watershed

Watershed	Road Length (mi)	Road Density (mi/mi^2)	Number of Drainage Structures[1]
Game Creek	0.0	0.0	0
Indian River	12.5	0.45	108
Freshwater Creek	7.2	0.44	55
10-Mile Creek	3.5	0.42	77
Total	23.2	0.38	240

Source: Kelliher. 1996.
[1]Drainage structures were only counted along main roads. Nearly all structures along spur roads have been removed.

Watershed analysis data show few areas with surface erosion problems (Paustian et al. 1996). Most of the road system is in the valley bottoms or along foot slopes, reducing the amount of cut- and fill-slopes. Road #7500 climbs out of the Indian River drainage and Freshwater Creek drainage, and is the only significant section of road that crosses mountain slopes. This section of road is well constructed. Cut banks and fill slopes have revegetated in many places, leaving little bare ground. The road surface throughout the watershed analysis area consists of competent rock overlay that is highly resistant to breakdown and erosion, thus reducing sediment production.

However, some drainage structures have failed or are in poor condition, and some road prism erosion has occurred within each watershed. (See Table 3-6.) The number of erosion sites is highest in the 10-Mile Creek watershed, where the road crosses the bases of steep and unstable alluvial fans. Moving bedload in these alluvial fan channels has plugged culverts and caused water to run over to wash out portions of Road #7502.

Table 3-6
Condition of Drainage Structures, and Number of Sites With Road Prism Erosion

Watershed	Drainage Structure Condition (Percent by Condition Class)				Number of road sites with erosion
	Failed ** (more than 80% blocked)	Poor ** (50-80% blocked)	Fair ** (25-50% blocked)	Good ** (less than 25% blocked)	
Game Cr.	0	0	0	0	0
Indian River	6	8	12	74	4
Freshwater Cr.	2	11	27	70	6
10-Mile Cr.	8	6	14	73	9

Source: Paustian et al. 1996.
** Figures in these columns are percentages of total drainage structures within each watershed .

Sediment Production from Surface Erosion

Sediment delivery from surface erosion is controlled by the nearness of roads to alluvial fans and flood plains, the frequency of stream crossings, and road drainage design. Sediment from these erosion sites may reach the main stem stream. The amount of sediment produced by road prism erosion is extremely small when compared to the amount produced by natural landslides. In the Indian River and Freshwater Creek watersheds, the existing roads are not close to main stem channels; this creates a larger buffer area in which to trap sediment.

Surface erosion from previous harvest units is minimal. Immediately after logging, bare ground may have been present in units. In the time since harvest, however, vegetation has stabilized most of the ground, protecting it from surface erosion.

Water

The Project Area, located within the coastal rain forest of Southeast Alaska, is characterized by an abundance of water. A dominant maritime climate annually produces heavy precipitation, resulting in the formation of many rivers, streams, lakes, ponds, and wetlands. These abundant water systems provide spawning and rearing habitat for salmon and resident fish -- aquatic resources important to sport, commercial, and subsistence users of the area.

Stream Flow

Streamflow regimes for Indian River, Freshwater Creek, and 10-Mile Creek are typical of island watersheds in Southeast Alaska. Runoff responds directly to rainfall, except for a smaller peak in late spring during snow melt. Streamflow records for the Indian River watershed are limited to an eight-year record for the upper area (13 sq. mi.) of the watershed (1972 to 1985). Unit runoff estimates range from 15 to 17 cubic feet per second per square mile (cfs/sq. mi.) in October, to 5 to 6 cfs/sq. mi. in August (Paustian et al. 1996). No flow records exist for either Freshwater Creek or 10-Mile Creek. Since these three watersheds have similar proportions of timber harvest and roads, the Indian River analysis results can be extrapolated to some degree to the 10-Mile Creek and Freshwater Creek watersheds.

Indian River. Indian River is the largest watershed in the Project Area. The basin has an elongated, narrow shape with a steep mountain ridge forming the north side slope. A lower, moderately sloped ridge forms the south side slope, and a broad alluvial flatland occupies the valley bottom. The basin has a classic U-shaped cross-sectional profile. Indian River has the most area in wetlands and flood plain landforms, which tends to increase rainfall/ runoff absorption and retard streamflow response times. Karst geology on the north slope also affects flow routing from alpine headwater catchments through runoff storage.

Upper Freshwater Creek. This basin is second largest of the three major watersheds. The overall basin pattern is semicircular, with three wedge-shaped sub-basins converging flow to a central main stem. The main stem flows through a deep bedrock gorge before joining the North Fork Freshwater Creek at the estuary. Two northern sub-basins are elongated with V-shaped valley cross-sectional profiles. The southern sub-basin has a broader valley bottom. No streamflow measurements are available for Freshwater Creek. However, due to similar rainfall levels, seasonal and event runoff patterns should closely mirror Indian River.

10-Mile Creek. The 10-Mile Creek watershed is the smallest, and the main stem channel is the shortest, in the Project Area. The valley profile is steep and V-shaped. Due to the steep basin relief and short main stem length, this basin has the quickest response to storm runoff and is the most efficient in routing runoff to the main stem channel. Unit area runoff is estimated to be higher than the other watersheds due to structural characteristics.

Game Creek. A small portion (750 acres) of the Game Creek drainage is also located in the Project Area. The overall basin is broad and gently sloped, with stream runoff flowing into alluvial flatlands in the valley bottom.

Peak and Low Flows

Seasonal low flows and peak flows can affect stream channel migration, channel conditions, water quality and egg survival for salmonids (Paustian et al. 1996).

Rain-on-snow peak flow events have the greatest susceptibility to change as the result of timber harvest in Southeast Alaska watersheds. Areas with shallow winter snow pack and large canopy openings such as clearcut units are the most important source zones for rain-on-snow floods (Paustian et al. 1996). The Indian River Watershed Analysis showed no significant difference between pre- and post-harvest winter peak and summer low flows. The analysis showed that winter rain-on-snow flood events are infrequent in the area and that major peak flows are primarily associated with September or October rainfall events.

August is considered a critical period for summer low flows in the analysis area, due to warm temperatures and little or no precipitation. Alpine snowpack runoff contributions to base stream flow are small at that time, and adult salmon migration also begins.

Water Quality

Temperature, dissolved oxygen, pH, turbidity, and total dissolved solids are the parameters adopted by the State of Alaska as standards for assessing surface water quality. In general, water quality within the Project Area is good. Stream chemical components appear similar to pristine conditions, and water temperatures for all drainages are within standards established for the propagation and growth of fish.

Sediment data collected from Indian River between 1977 and 1981 indicate that past timber harvest activities had no measurable effect on turbidity or fine sediment concentrations in the river. Subsequent observations of erosion sources in the Indian River, 10-Mile Creek and Freshwater Creek watersheds show that general turbidity and fine sediment levels have met and currently meet State water quality standards. Possible exceptions to this general observation include localized, short-term sedimentation associated with construction of road drainage structures, minor road washouts, and some small scale mass wasting events within harvest units.

Removal of riparian canopy can have a short-term beneficial effect on juvenile salmon; higher temperatures associated with the resulting increased sunlight can increase juvenile production and growth rates. Over the long term, however, subsequent alder and second-growth conifer regeneration can have detrimental effects in small rearing channels. Increased canopy closure can diminish sunlight, create colder stream temperatures, decrease food supply and thereby reduce juvenile growth rates. Stream temperature data from Indian River indicate that State of Alaska stream temperature standards are currently being met in the Project Area (Paustian et al. 1996). According to the data, summer stream temperatures may have increased up to six degrees Fahrenheit in some tributaries and portions of main stem channels where the adjacent riparian timber has been clearcut.

The proportion of clearcut harvest along streams in the Project Area can be used as a relative index of cumulative sunlight and temperature changes associated with second-growth riparian stand development. Miles of clearcut harvest by stream class, process group, and watershed for the analysis area are summarized in the Indian River Watershed Analysis (IRWA, pp. 77-78). Based on this riparian harvest index, 10-Mile Creek and Indian River are unlikely to experience major stream temperature changes in the future. Indian River also has a large fen wetland riparian component that will act as a buffer to effects of riparian harvest on some forested channels. The Freshwater Creek basin has the greatest chance of cumulative temperature change due to a high percentage (3.3 miles or 16 percent) of main stream or valley bottom stream channels having been harvested.

Stream Channel Condition

Effects of timber harvest on channel morphology and habitat from accelerated mass wasting can have serious long-term impacts to stream productivity (Paustian et al. 1996). Estimates of annual total sediment loads (width-to-depth ratio, and riffle stability index) were used to evaluate cumulative effects of mass wasting.

Channel structure and riffle stability data were collected for several response reaches in the Project Area. Response reaches are stream sections that are sediment-sensitive and quickly reflect changes in the upstream sediment budget. Fish habitat objectives have been established for key habitat channel types. Objectives were measured by changes in width-to-depth ratios. These data for Indian River and Freshwater Creek indicate that the reaches are presently stable, but are approaching a threshold where they may respond negatively to increased sediment loads. The data for 10-Mile Creek indicate its stable condition is unlikely to change unless a massive increase in sediment occurs.

Fish and Fish Habitat

Stream Habitat Condition

In 1989 and 1995, stream surveys to determine habitat condition were completed on segments of the Indian River, 10-Mile Creek, and Freshwater Creek (Paustian 1996). The stream survey data were used to determine variability within a watershed, and to compare with Regional Fish Habitat Objectives specifying desired physical and biological conditions for fish habitat in Southeast Alaska. Data collected in the surveys included:

- amount and size of large woody debris (LWD);
- number, type, and size of pools;
- number and size of riffles and glides;
- amount of off-channel and secondary channels;
- average and maximum depth of pools;
- dominant substrate size; and
- undercut bank area.

The data shows most of the streams in the analysis area to be in a near pristine condition. Although past harvest activities have affected some key riparian areas and wetlands, the overall abundance of pools, pool area, and LWD indicate healthy and productive streams.

Stream Classes, Habitat Distribution, and Use

Class I streams have anadromous or adfluvial fish habitat. This can include habitat upstream of existing barrier falls, if the habitat can be enhanced by such techniques as fish pass construction or juvenile salmon stocking. Class II streams contain resident fish populations with limited sport fishery value. Class III streams contain no fish but have potential water quality influence on downstream aquatic habitats. Table 3-7 shows the stream class distribution for the watersheds within the Project Area.

Table 3-7
Stream Miles by Stream Class

VCU	Class I	Class II	Class III
Game Creek	0.5	1.1	2.1
Freshwater Creek	17.4	24.3	34.5
Indian River	36.2	27.8	60.9
10-Mile Creek	5.2	6.2	25.5
Total	59.3	59.4	123.0

Source: Paustian et al. 1996.

Anadromous fish species within the Project Area include pink, chum, coho, and chinook salmon, steelhead, and Dolly Varden char. Resident game species are cutthroat and rainbow trout, and Dolly Varden. Most critical Class I stream habitat for anadromous and resident fish is in the estuary, flood plain, and low-gradient contained channels. Where accessible, these low-gradient channels provide much of the available spawning habitat for all fish species present in the Indian River Project Area. These channels, along with associated secondary channels and smaller flood plain channels, provide rearing habitat for juvenile coho salmon, steelhead and cutthroat trout, and Dolly Varden.

Palustrine channels, sloughs, and associated beaver ponds are abundant in the Indian River watershed. A few palustrine channels occur in the Freshwater Creek watershed. Primarily associated with fens, palustrine channels and beaver pond areas are characterized by organic sediments, abundant deep pool and glide areas with cover, and spring-fed tributaries. These channels and ponds provide high quality rearing and limited spawning habitat for coho salmon, Dolly Varden, and cutthroat trout.

All fish species also use the accessible habitat in the moderate gradient channels. These channels contain low to moderate amounts of spawning and rearing habitat. Stronger swimming coho salmon, cutthroat trout, and Dolly Varden make the most use of this habitat. All three major watersheds in the Project Area have waterfalls on their main channels, which either exclude all anadromous fish (Freshwater Creek) or substantially reduce the habitat accessible to anadromous fish (Indian River and 10-Mile Creek).

Wind

Blowdown is a natural process in the Project Area, and occurs at disturbance levels ranging from a single tree to an area covering many acres. Windthrow along stream riparian areas is a primary source for instream large woody debris (LWD), which maintains and creates fish habitat. However, management activities, such as clearcuts and roads next to stream riparian areas, can greatly increase the rate of blowdown along a stream and negatively impact future stream habitat condition. Wind disturbances associated with recent timber harvest are present in all three watersheds. Results of an aerial survey (July 1995) show that blowdown has occurred adjacent to 60 percent of the harvest units and in several riparian buffer strips (Trull et al. 1997).

Previous Timber Harvest

There are 59 miles of Class I and II stream segments in the Indian River watershed. Timber harvesting to the edge of one or both stream banks occurred prior to the Tongass Timber Reform Act (TTRA) along 5.7 miles (10 percent) of these segments. This included isolated segments of the main stem flood plain channel. Approximately 1.3 miles (2.5 percent) of high gradient Class III stream segments were harvested to the stream banks.

There are 47 miles of Class I and II stream segments in the Freshwater Creek watershed. Timber harvesting to stream banks occurred on 7.0 miles (15 percent) of these stream segments. Timber harvest has occurred along 0.8 mile (2 percent) of high gradient Class III channel segments in this watershed. The survey data indicate a healthy stream habitat condition. However, this healthy condition will decline as existing instream LWD and stumps along stream banks decompose and wash out of the system.

There are 11 miles of Class I and II stream segments in the 10-Mile Creek watershed. Streamside harvesting in 10-Mile Creek was restricted to 2.8 miles (25 percent) along these segments. Harvest occurred along one mile (4 percent) of high gradient Class III channels. Several steeper alluvial fans and V-notches were harvested. Many of these channels are unstable and prone to mass movement failures. This poses a threat to stream habitat, although the moderate gradient main channel has a high sediment transport capability.

Roads and Fish Habitat

Road corridors through riparian areas can potentially impact aquatic resources. However, existing road corridors in the Project Area generally avoid core wetland and stream riparian areas. The current road system also stays away from major sediment source areas in the three major watersheds. (See Table 3-8).

Table 3-8
Stream Riparian Area Influenced by Existing Roads and Harvest Units

	Indian River	Freshwater Creek	10-Mile Creek
Total riparian area acres	2,278	2,009	785
Road acres in riparian area	21	15	6.7
Harvest unit acres in riparian area	120	162	59
Total managed acres*	141	177	66
% total riparian area influenced	6%	9%	8%

*Road acres + harvest unit acres
Source: Paustian et al. 1996

Much of the Project Area is accessed by a logging road which begins east of the mouth of Indian River and continues along the river's east side, beyond the upstream end of the watershed. This road continues over the "pass" to the Freshwater Creek and 10-Mile Creek watersheds. The road parallels the upstream half of the 10-Mile Creek watershed, and another fork of the road parallels Freshwater Creek. Most roads are located in valley bottoms and lower valley sideslopes; therefore, potential sediment sources from road cutslopes and embankments are limited. An inventory of drainage structures on the entire road system within the Project Area was completed in the summer of 1994 (Paustian et al. 1996) and repeated in the summer of 1995 (Table 3-9). These data provide information on existing fish pass barriers, impacts from beaver activity, sediment source areas, and general trends in the Project Area.

Table 3-9
Stream Class I and II Drainage Structures that are Fish Passage Barriers or are Affected by Beaver Activity (includes road washout sites)

Watershed	Class I Streams		Class II Streams		Washout	Beaver	Fish Passage
	Culverts	Bridges	Culverts	Bridges	Sites	Impacted	Barriers
Game Creek	0	0	0	0	0	0	0
Indian River	17	4	3	2	6	9	7
Upper Freshwater	11	6	4	0	4	0	4
10-Mile Creek	2	7	3	3	3	0	0
Total	30	17	10	5	13	9	11

Source: Paustian et al. 1996.

Riparian Management Areas

The Anadromous Fish Habitat Assessment (USDA Forest Service 1995) identified several concerns with current efforts to minimize accelerated erosion after timber harvest activities. Specifically, the report stated that stream buffers along Class I and II streams are not always wide enough to ensure protection from sedimentation, and that Class III streams are not given enough protection to fully control sedimentation. Also, clearcut harvesting and road construction on steep and unstable slopes has, in some cases, created increased risk of landslides and subsequent sedimentation to streams. Deficiencies in maintaining or closing out road systems could potentially cause road failures which would also lead to increased sedimentation.

To address these concerns, Forest Service soils, hydrology, and fisheries specialists identified and delineated Riparian Management Areas (RMAs) within the Project Area (Paustian et al. 1996). RMAs are land areas which are directly linked to streams, lakes, and ponds, and are of special concern in regard to fish, other aquatic resources, and wildlife. Specific standards and guidelines, designed to maintain stream and wetland integrity, are associated with RMAs. The areas delineated by the specialists include stream riparian buffers, sediment source areas, and rich fens. (Note: RMAs may or may not include all of the actual riparian area. See Glossary for detailed definitions, and Vegetation section for further discussion of RMAs.)

Stream riparian buffers are variable-width buffers within Riparian Management Areas, designed to protect the streams from the effects of harvest units or roads. Along Class I and II streams, these may vary in width from 100 feet (the minimum required by the Tongass Timber Reform Act) to 650 feet, depending on channel type or stream characteristics. Stream riparian buffer widths were verified in the field by completing transects across the stream and adjacent vegetation.

RMAs also include riparian buffers along Class III channels which run along many of the unit boundaries. These higher-gradient channels can become unstable and produce sediment after harvest. However, cutting up to the edge of the incised channel and leaving all the trees within it can also leave an edge susceptible to windthrow. This could lead to more sediment than would be caused by logging. To minimize this potential problem, Class III channels of concern were identified and documented in the unit cards, along with recommendations for ensuring a windfirm boundary along them. This would be done by either leaving a feathered boundary approximately 100 feet wide, or making an edge cut within the channel incision which would leave no more than one-third of the trees' height exposed to the wind. Final site-specific buffer design would be completed during unit design and layout. (Refer to Appendix J for more details and specific examples.)

Sediment source areas (SSAs) are areas within the RMA classified as having a very high mass movement hazard or high mass movement hazard with high potential for sediment delivery to streams. Many of the SSAs in the Project Area correspond to extreme mass movement hazard areas which are considered too unstable to log. Some SSAs, however, are rated as high mass movement hazard; these are in the timber base, and some were included in the harvest unit pool. A Forest Service soil scientist or hydrologist reviewed these areas in the field and made recommendations to minimize potential sediment production, such as harvest prescriptions that leave many trees within the unit to help maintain soil stability.

Fish Enhancement

Extensive low gradient, floodplain streams and adjacent beaver ponds upstream of the barrier falls at Indian River could provide high quality rearing habitat for salmonids. This habitat was recognized as a potential fishery enhancement site in the early 1980s. The Forest Service and Alaska Department of Fish and Game (ADF&G) cooperated to initially stock 50,000 chinook salmon fry into the floodplain section of Indian River in 1986. Chinook salmon fry were stocked into Indian River again in 1988 and 1993. The 1986 and 1988 stockings were extensively monitored as part of a research project (Killinger 1994).

Monitoring during and after chinook salmon rearing in the stream did not show impacts on the resident Dolly Varden population. Dolly Varden are predominantly bottom feeders, while rearing juvenile chinook feed mostly in the middle to surface area of the water column. Approximately 100 chinook salmon survived to an adult life stage from the 1986 and 1988 stockings. The 1993 stocking will begin producing adult chinook salmon in 1997.

Recreational Fisheries

Executive Order 12962 (Recreational Fisheries, June 7, 1995) directs Federal agencies to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. Section 1 of the Order directs Federal agencies to evaluate effects on aquatic ecosystems and recreational fisheries, develop and encourage partnerships, promote restoration, and provide access and promote awareness of opportunities of recreational fishery resources.

High value recreational fishing opportunities are found both in and adjacent to the Project Area. Although the majority of the sport fishing occurs in the saltwater (especially in the Tenakee Inlet area), freshwater fishing also occurs.

The majority of the freshwater sport fishing occurs in the lower portion of Indian River (below the barrier waterfall), and in the lower end of 10-Mile Creek. Indian River is accessed from Tenakee Springs by a maintained trail that crosses the river. The sport fishery portion of 10-Mile Creek is accessed by boat. The Project Area portion of Freshwater Creek is located upstream of barrier waterfalls. It has no anadromous fish and no resident fish large enough to attract anglers. However, this basin does influence water quality and flows that, in turn, directly influence key downstream anadromous fish habitat outside the Project Area.

ADF&G has given the Indian River and Freshwater watersheds the highest qualitative rating for commercial and sport fish values. Indian River escapement records from 1964 to 1994 show annual pink salmon escapement counts up to 46,000, with an average of about 7,800. Annual chum salmon escapements are as high as 4,500, with an average of about 450 (ADF&G 1994). Indian River also produces coho salmon, Dolly Varden, and steelhead trout. Juvenile chinook salmon have been stocked three times (1986, 1988, and 1993) in the abundant habitat upstream of the barrier falls at Indian River. Adult chinook returning from these stockings have been available for recreational fishing both in saltwater and in the lower Indian River. The upstream area and ponds have a resident population of Dolly Varden, some of which are large enough for sportfishers.

Recreational Fisheries Economics

According to the most recent Southeast Alaska Sport Fishing Economic Study (Jones & Stokes Associates, Inc. 1991), sport fishers in the nearby Sitka Harvest Area spent an estimated $10.7 million in 1988 fishing for chinook salmon, coho salmon, and halibut. In Southeast Alaska, chinook salmon generated the most spending by both resident and non-resident anglers of all species sought. Residents spent more to catch coho salmon than they did to catch halibut, while non-residents spent more to catch halibut than coho salmon.

Sport fishers who fished in Southeast Alaska purchased goods and services from a variety of businesses. Spending at these sources directly supported the equivalent of 657 full time jobs in 1988. The multiplier effect of these purchases resulted in the equivalent of 950 full time jobs, having an earnings value of $22.5 million. Associated revenues generated from sportfishing include local sales tax, State fishing licenses, and corporate income taxes. Beyond the numbers, fishing in the inlets, bays and streams of the Project Area is important to the quality of life of many Southeast Alaska residents and non-residents.

Vegetation

Within the Project Area, mountain hemlock, heath, and alpine meadow communities occur at high elevation. Sitka alder and salmonberry dominate on steep brush fields. Beside and below the brush fields are highly productive, forested slopes. On valley bottoms, wetlands are common. One wetland type is rich fens, or areas of sedge peat accumulation. Also common is a shore pine/crowberry community. On gently sloping landforms, open mixed conifer/blueberry and mixed conifer/ blueberry/skunk cabbage communities are dominant. Near large streams, where drainage is better, highly productive Sitka spruce stands dominate.

Vegetation by Landtype Association

Following are descriptions of Project Area vegetation, grouped by landtype association. (See Landscape Ecology in this chapter, and Appendix H for more landtype association details. Appendix H also includes a reference list of common and scientific plant names.)

Alpine and Subalpine Summits and Ridges

These summits and ridges generally have extensive areas of heath plant community types. Crowberry, luetkea, mertens mountain heather, and deer cabbage are common species. Where soil has developed, these slopes have a rich plant diversity. Mountain hemlock, with minor amounts of Sitka spruce, occurs in protected areas as a dwarf forest called krummholz. Tall blueberry and copperbush are scattered among the trees. Alpine meadows, rock outcrop, and fellfield communities also occur.

Brushfields

Brushfields are dominated by Sitka alder and salmonberry. Other common species include lady fern, Sitka willow, stink currant, and false hellebore. Inclusions of subalpine meadows and krummholz mountain hemlock communities also occur. In some areas, Sitka spruce is slowly invading the brushfields.

Steep Forested Mountain Slopes

The dominant overstory species are Sitka spruce, mountain hemlock, and western hemlock. Devil's club, blueberry, and copperbush are the primary tall shrubs. There are also open stands of mountain hemlock at higher elevations. On benches of broken slopes, mixed conifer open forest and nonforested wetland areas occur as inclusions.

Moderately Steep Forested Mountain Slopes

The dominant overstory species are western hemlock, Sitka spruce, and yellowcedar. A wide variety of plant associations from the western hemlock, western hemlock-yellowcedar, and mixed conifer series occurs on this association. Devil's club and blueberry are the dominant tall shrubs. Bench inclusions may have mixed conifer open forest or nonforested wetland vegetation.

Forested Hills

The forests are moderately to marginally productive for timber. Two common plant associations are western hemlock/blueberry and mixed conifer/blueberry. The vegetation mosaic is slowly changing as some areas are invaded by sphagnum moss and other wetland species. Skunk cabbage is common in the wetter areas.

Colluvial/Fluvial/Coastal Surfaces

On the frequently disturbed flood plains and fans, the vegetation is composed of a wide to narrow band of red alder, Sitka alder, and salmonberry. Black cottonwood occurs in some areas. Highly productive Sitka spruce and western hemlock forests dominate the raised alluvial terraces above the yearly flood plain communities and the uplifted beaches and rock headlands.

Lowland Wetland-Forest Complex

Bogs (muskegs) are common, where peat moss and sedge peat have accumulated and filled in small depressions and flats. They are primarily dominated by shore pine/sedge and tufted clubrush/peatmoss community types. Where drainage is better, as along small stream channels, a shore pine or mixed conifer forested wetland occurs. Rich fens occur where waters are calcium-rich, such as in the lower Indian River watershed.

Estuaries/Beaches

On the upper tidal flats, lyngbyei sedge, alkali grass, and other salt tolerant species dominate. Adjacent to estuaries, in the supratidal meadows, bluejoint, cow parsnip, and Sitka sedge are common species.

Old-Growth Forests

On the Chatham Area, old-growth forests have been classified into six different series based on tree species (Martin et al. 1995): Western Hemlock, Western Hemlock-Yellowcedar, Sitka Spruce, Mountain Hemlock, Mixed Conifer, and Shore Pine. Most timber harvest has occurred in the productive old-growth below 800 feet in elevation. Harvest activity on Northeast Chichagof Island began in earnest in 1956. Since then, over 23,500 acres have been harvested, which represents about 14 percent of the productive forest on the island. (See Wildlife and Timber sections in this chapter for further discussion of old-growth forests in the Project Area.)

Table 3-10 displays productive old-growth forest acres as of 1994 for each of the landtype associations in the Project Area.

Table 3-10
Acres of Productive Old-Growth Forest in 1994 by Landtype Association

Landtype Association	Project Area	VCU 2041	VCU 2160	VCU 2200	VCU 2201	VCU 2210	VCU 2221
Alpine/Subalpine Summits and Ridges	539	0	111	223	36	92	77
Brushfields	2,144	48	550	660	105	345	436
Steep Forested Mountain Slopes	5,873	81	1,444	1,291	427	1,580	1,050
Moderately Steep Forested Mountain Slopes	3,840	8	1,148	1,915	333	85	351
Forested Hills	306	0	124	48	134	0	0
Colluvial/Fluvial/ Coastal Surfaces	2,234	135	681	676	81	216	445
Lowland Wetland-Forest Complex	1,132	10	605	401	116	0	0
Estuaries/Beaches	0	0	0	0	0	0	0
Total	16,068	282	4,663	5,214	1,232	2,318	2,359

Source: Trull et al. 1997

Wind Disturbance and Recent Timber Harvest

Disturbance, whether natural or human-induced, affects the distribution of different forest structures across the landscape. Small-scale windthrow (i.e., blowdown of a single tree or small group of trees) is the most common disturbance factor on the Tongass (DeMeo et al. 1992; Harris 1989). Ott (1995) found that canopy gaps occupy about nine percent of old-growth western hemlock/blueberry/shield fern communities. Most of these were less than 540 square feet, and had been formed by the blowdown of three or fewer trees.

Wind disturbances associated with recent timber harvest are present in the three major Project Area watersheds. How many wind events caused the existing blowdown damage around harvest units is unknown. The direction that the edge of a buffer strip faces does not always control whether the buffer will be prone to wind damage. In an aerial survey of tree-fall directions around harvest units (July 1995), the harvest unit edges of both wind-disturbed and undisturbed buffer strips faced in various directions (Trull et al. 1997). (See the Fish and Timber sections in this chapter for further discussion of past timber harvest and wind effects on the Project Area forests.)

Vegetation in Riparian Areas

Riparian areas are difficult to define by a discrete line. While streamflow dynamics, floods, and moisture conditions influence vegetation within the riparian area, this influence gradually decreases with increased distance away from the stream or river. The Forest Service has therefore delineated Riparian Management Areas (RMAs) with specific boundaries. These boundaries may be based on vegetation changes (e.g., transition from spruce-dominated types to forests dominated by other species), steep grade breaks in stream banks (a point which often coincides with the spruce transition), or obvious land forms such as major flood plain terraces.

The widths of the Project Area RMAs were calibrated from riparian vegetation and slope data collected in field transects on a selection of channel type segments. A total of 31 riparian transects in the Indian River, 10-Mile Creek, and Freshwater Creek watersheds were conducted in 1994 and 1995, along with an additional 24 riparian transects in the adjacent Game Creek watershed (Paustian et al. 1996). The following information was derived from these transects. (See the Fish Habitat section and the Indian River Watershed Analysis, pp. 62-63 for further details.)

Along contained channels, there are narrow, broken bands of non-forested riparian vegetation that often contain Sitka alder, devil's club, stink currant, and oak fern. Above this vegetation, there typically is a western hemlock/blueberry plant association.

Along the flood plain channel types, the size of non-forested vegetation communities generally increases downstream. In the Project Area, they can be as wide as 375 feet or more. Vegetation includes red alder, devil's club, salmonberry, stink currant, oak fern, lady fern, cow parsnip, and horsetail. Sitka spruce plant associations (e.g., Sitka spruce/devil's club and Sitka spruce/blueberry) occur farther from the river, on slightly raised terraces. On even higher terraces, western hemlock plant associations are found.

Along the alluvial fan channels, the vegetation is primarily western hemlock/devil's club and Sitka spruce/devil's club forest types. However, one fan in the center of Indian River valley has several cottonwood, which is an uncommon species on the islands of Southeast Alaska.

Along the palustrine channels, the vegetation is a mixture of forest vegetation with more extensive areas of wetland vegetation. Some of these channels have forested and non-forested bogs along their margins, while others have calcareous fens or marshes.

Wetlands

The Army Corps of Engineers (ACOE) and the Environmental Protection Agency jointly define wetlands as: "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (ACOE 1987)

Executive Order 11990, as amended, (Protection of Wetlands, May 1977) requires Federal agencies that exercise statutory authority and leadership over Federal lands to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands. Where practicable, direct or indirect support of new construction in wetlands must be avoided. Sections 404(f)(1)(A) and (E) of the Federal Clean Water Act specifically exempt silviculture, timber harvesting, and related road construction activities from permit requirements for the discharge of dredge and fill material in wetlands (USDA Forest Service 1991).

The National Wetlands Inventory (NWI) maps were used to determine the distribution and acres of wetlands for the Project Area (Table 3-11). The NWI is a U.S. Fish and Wildlife Service program that uses a hierarchical approach to classifying different wetland types. The NWI classifies wetlands first into five major systems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. Riverine was excluded from this analysis since the stream classification system used by the Forest Service is more detailed (Paustian et al. 1992).

Ground water chemistry helps explain the distribution of wetlands in the study area. Bogs are wetlands where peat accumulation has separated the bog surface from ground water (e.g., domed bog). They receive their mineral supply solely from rain or snow (National Wetlands Working Group 1988). In contrast, rich fens are areas of sedge peat accumulation, with slow internal drainage by seepage down low gradients. The soils are primarily organic, with three to six feet of sedge peat accumulated. The slow moving water is enriched by nutrients from upslope materials, making the fens more mineral-rich than bogs. The vegetation generally reflects the water quality and quantity, resulting in sedge and grass fens (without trees or shrubs), shrub fens, and treed fens (National Wetlands Working Group 1988). Poor fens are intermediate between bogs and rich fens.

Except for a small amount of timber harvest and road building in some forested and nonforested wetlands, most wetlands within the watersheds are in an undisturbed condition. To date, few bogs and fens have been roaded. Rich fens have 1.4 miles of road through them: 1 mile in the Indian River watershed and 0.4 miles in the Freshwater Creek watershed. Presently, the forested and nonforested bogs are not a pressing biodiversity concern, since they are a common ecosystem of Southeast Alaska.

Table 3-11
Wetland Acres within Landtype Associations by VCU for the Project Area

Landtype Association	Project Area	VCU 2041	VCU 2160	VCU 2200	VCU 2201	VCU 2210	VCU 2221
Alpine/Subalpine Summits and Ridges	519.0	0	92.9	175.0	8.8	93.9	148.0
Brushfields	42.4	0	20.7	9.7	0	11.8	0.3
Steep Forested Mountain Slopes	118.0	0	22.7	36.6	20.8	18.3	19.6
Mod. Steep Forested Mountain Slopes	2,884.0	12.6	1,059.0	1,095.0	702.0	4.1	11.4
Forested Hills	681.0	0	7.4	11.1	662.0	0	0
Colluvial/Fluvial/ Coastal Surfaces	262.0	12.3	53.3	144.0	41.2	0.82	10.8
Lowland Wetland-Forest Complex	1,911.0	85.1	882.0	526.0	381.0	36.8	0
Estuaries/Beaches	16.0	0	0	0	16.0	0	0
Total	6,433.0	110.0	2,138.0	1,997.0	1,832.0	166.0	190.0

Source: Trull et al. 1997

Wildlife

The Tongass National Forest provides habitat for 54 species of mammals, 231 species of birds, and five species of amphibians and reptiles. There are an additional 18 species of marine mammals found in Southeast Alaska which depend entirely on the ocean environment, and 45 birds and 3 amphibian or reptile species considered casual or accidental visitors to Southeast Alaska (USDA Forest Service 1997a). Many of these species can be found in the Project Area. Two notable exceptions are black bear and wolf, which are not found anywhere on Chichagof Island.

Wildlife are found in a diverse range of land types and plant communities, and are adapted to climatic extremes, changes in habitat, predation, and hunting pressure. This results in a Project Area rich in both species and habitats. This richness is appreciated and valued by the public. Wildlife may be viewed and photographed; harvested for sport or subsistence purposes; and valued for spiritual or ecological reasons.

Wildlife Habitat

Habitat is the environment in which a wildlife species occurs. It is described in physical and biological terms, which include elevation, topography, forest structure, and vegetation type. A wildlife species may occupy a range of habitat types at various times of the year. Important habitat types that occur in the Project Area include beach fringe, estuary fringe, old-growth, second-growth, alpine/subalpine, and riparian areas. The acres of these habitats in the Project Area are displayed in Table 3-12. Since alpine/subalpine habitats will not be affected by the proposed timber management activities, they will not be discussed in this section.

Beach Fringe Habitat

Beach fringe is the strip of land within a 1000-foot horizontal distance inland from the salt water shoreline, not including estuaries. It is a transitional zone between land and water, salt water and fresh water, and vegetated and non-vegetated conditions (USDA Forest Service 1997a). Forested areas in this transition zone receive heavy use by species which have high economic, recreational, subsistence, or aesthetic values. Brown bear, river otter, bald eagle, marten, and Sitka black-tailed deer are typical species that concentrate their activities in these forest stands during some or all seasons of the year.

Estuary Fringe Habitat

Estuary fringe is the land within 1,000-foot horizontal distance around river mouths, or estuaries. It is similar to beach fringe, but because of its species diversity it has greater value to wildlife, especially brown bears, river otters, mink, bald eagles, and waterfowl.

Old-Growth Habitat

In this EIS section, old-growth habitat refers to inventoried forest stands with a timber volume greater than 8,000 board feet per acre, having trees which are at least 150 years old, with an average diameter at breast height greater than nine inches. Old-growth forests typically possess the following characteristics:

- large trees, with wide variation in tree sizes and spacing;
- accumulations of large, dead, standing and fallen trees;
- a high incidence of trees with broken or deformed tops, disease, and decay; and
- multiple canopy layers, with canopy gaps and understory patchiness.

These characteristics, and the spatial arrangement of old-growth habitat, influence the function of the ecosystem. Old-growth forests are important habitat for Sitka black-tailed deer, marten, brown bear, and cavity nesting birds such as the hairy woodpecker. Acres of old-growth forest are also included in beach fringe, estuary fringe, riparian and other habitat type acreages.

Second-growth Habitat

Second-growth habitats are even-aged stands less than 150 years old that have been commercially harvested. Second-growth habitat is of lower value to most wildlife, because conifer seedlings aggressively invade and eventually shade out desirable herbaceous vegetation.

Riparian Habitat

Riparian areas occur along rivers and streams or around inland lakes, and contain elements of both aquatic and terrestrial ecosystems. These areas are important migration routes for some wildlife species, because of the presence of water, food, and cover. Riparian habitats in the Project Area are very important for eagles, furbearers, and brown bears.

Table 3-12
Acres of Project Area Wildlife Habitat

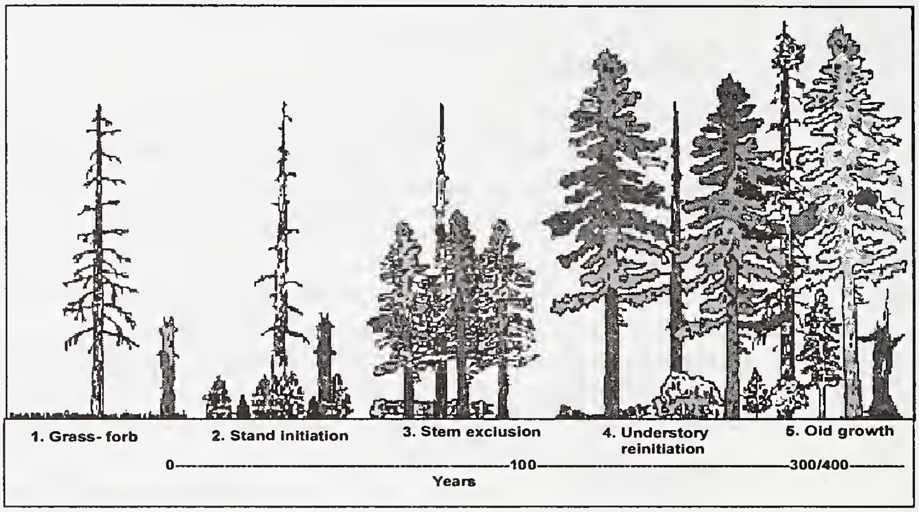
Habitat Type	Total Acres in 1996
Beach Fringe (Forested)	740
Estuary Fringe (Forested)	500
Old-growth	19,076
Second-growth	2,228
Riparian (Forested)	3,092

Source: Shipley 1996

Forest Function and Structure

Following clearcutting, a forest stand begins its progression to old-growth. For the first twenty years after harvest, the stand regenerates and abundant seedlings are started; this is called the stand initiation stage. As the new stand grows taller and the individual canopies touch, the understory is shaded and dies back; this stage is the stem exclusion stage, and lasts from 30 to 150 years after harvest. Approximately 130 to 160 years after harvest, understory develops and some features of old-growth structure occur (understory reinitiation stage). After an additional 150 years, old-growth forest structure is fully developed (old-growth stage). See Figure 3-3.

Figure 3-3 Forest Structure



Thinning in harvested stands would open the canopy, allowing forbs and shrubs to grow and provide forage. The benefits of these thinnings are usually short-lived; after 15-20 years, the canopy will again close and the understory layer will revert to moss cover. Repeated thinnings would provide some benefits to wildlife, although not at the same level as in undisturbed stands.

Fragmentation

Large, contiguous blocks of old-growth forest (patches) are generally recognized as an important factor in maintaining viable wildlife populations. As roads are constructed and timber is harvested in old-growth forest, these contiguous blocks are broken down, or fragmented, into smaller pieces.

Large-scale clearcut timber harvesting within the Project Area has fragmented old-growth habitats and altered their distribution. A GIS analysis was conducted to determine the effects of this past harvest and resulting fragmentation on old-growth patches. Table 3-13 and Figure 3-4 display the existing number of patches and total patch acres in the Project Area. The patches are grouped by size.

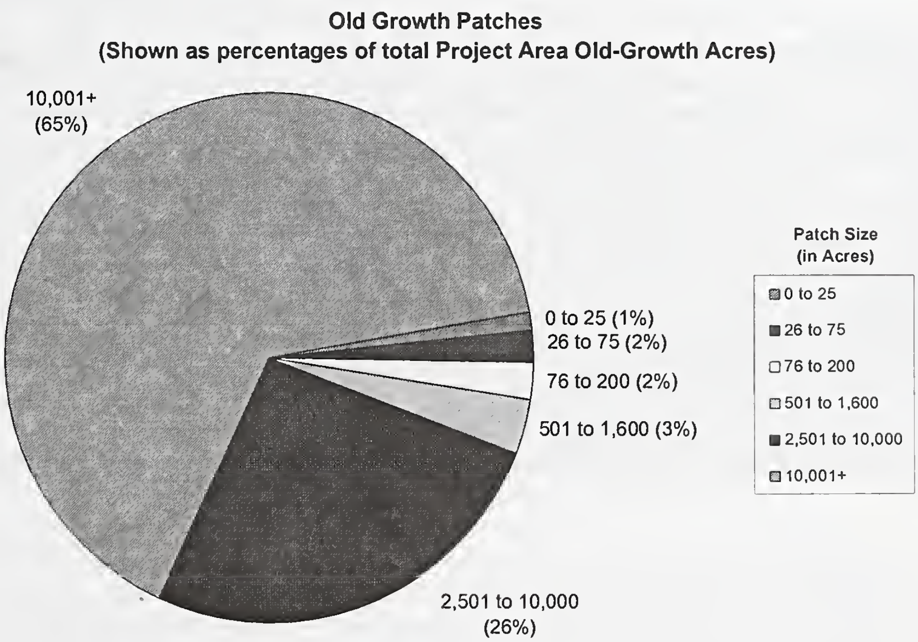
An optimal patch size has been determined for three management indicator species (MIS) as follows: brown creeper, greater than 15 acres; red-breasted sapsucker, greater than 250 acres; and hairy woodpecker, greater than 500 acres. Ninety-four percent of the old-growth patch acreage in the Project Area is contained in patches greater than 500 acres. Table 3-13 and Figure 3-4 display the percentage of patch acreage for each size category.

Table 3-13
Project Area Old-Growth Patch Size

Patch Size in Acres	Number of Patches	Total Patch Area Acres (%) *
0 to 25	13	168 (1%)
26 to 75	10	330 (2%)
76 to 200	3	377 (2%)
501 to 1600	2	530 (3%)
2,501 to 10,000	6	4,321 (26%)
Greater than 10,000	1	10,788 (65%)

Source: Peterson 1996
* Percentage of total old growth in Project Area.

Figure 3- 4 Old-Growth Patch Size



Management Indicator Species

Management Indicator Species (MIS) are species whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements. By using the MIS concept, the total number of species to be analyzed within a Project Area is reduced to a manageable set that collectively represents the complex of habitats, species, and associated management concerns. MIS are also used to help establish management goals for species in public demand, such as deer for sport hunting and subsistence uses. The 1997 TLMP standards and guidelines include the use of forest plan management indicators, such as MIS, to evaluate the potential effects of proposed actions affecting wildlife habitat (USDA Forest Service 1997a).

The MIS species chosen for this Project Area are the Sitka black-tailed deer, brown bear, river otter, marten, red squirrel, brown creeper, red-breasted sapsucker, hairy woodpecker, and bald eagle. Although some of these MIS are associated with several habitat types, all are associated with the spruce and hemlock forests found in the Project Area. Table 3-14 displays the relative importance of conifer successional stages as habitat for the chosen MIS. It can be seen that productive old-growth (that is, conifer stands greater than 150 years in age and having a volume of 8,000 board feet per acre or higher) provide essentially all of the highly important habitats, and most of the moderately important habitats, for all of the chosen MIS (USDA Forest Service 1997a).

Table 3-14
Relative Importance of Conifer Successional Stages as Habitats for Management Indicator Species

	Season of Use					Conifer Successional Stages					
						Early	Mid		Late (>200 years)		
Species	winter	spring	sum.	fall	all year	(in years) 0-25	(in years) 26-150	150-200	Unproductive Old-Growth	Productive Old-Growth Low-Med	High
Red Squirrel					x	L	L-H	H	L	M-H	M-H
Brown Bear			x			L	L	L	M-H	M-H	M-H
Marten	x					L	L	L	L	M	H
River Otter		x	x			L	L	M	L	H	H
Sitka Black-tail Deer	x					L-M	L	L-M	L-M	M	H
Bald Eagle		x	x			L	L	L	L	H	H
Red-br. Sapsucker		x	x			L	L	L	L	H	M
Hairy Woodpecker	x					L	L	L	L	L	M-H
Brown Creeper	x					L	L	L	L	L	L-H

Source: USDA Forest Service 1997a
H = Highest importance, high population densities.
M = Moderate importance, moderate population densities.
L = Least importance, low population densities.

Sitka Black-tailed Deer - *Odocoileus hemionous sitkensis*

Sitka black-tailed deer are found throughout Southeast Alaska. This wildlife species receives the highest sport hunting and subsistence use of all land species in this part of Alaska. The State of Alaska and the Federal Subsistence Board are responsible for the numbers of deer allowed to be taken for harvest (USDA Forest Service, 1997a).

Sitka black-tailed deer represent those species that use lower elevation old-growth forest habitats during winter. Winter habitat (both quantity and quality) is considered the most limiting factor for this species in Southeast Alaska. The deer winter habitat capability model takes into account snow depths and winter severity, the value of lower elevations and south-facing aspects, and conifer successional stages. Old-growth forests have the highest value because they intercept snow and provide understory forage plants. Lack of snow interception in early successional stages, and lack of forage in middle successional stages, reduce their value as deer habitat (USDA Forest Service, 1997a).

The Project Area currently has about 20,819 acres of forested land (all age classes and types of conifer forests) below 1,500 feet elevation within occupied deer habitat. The Sitka black-tailed deer model, as refined by the 1997 TLMP, was used to generate a Project Area habitat capability of 963 deer. (For more information regarding this model, see the 1997 TLMP EIS, pages 3-365 to 3-370.)

Sitka black-tailed deer use a variety of vegetation communities throughout the year, and no specific corridor requirements have been identified. The effects of patch size and forest fragmentation on deer habitat capability remain uncertain (USDA Forest Service 1997a). Due to their critical importance to subsistence users, Sitka black-tailed deer are discussed in further detail in the Subsistence sections of this EIS.

Brown Bear *Ursus arctos*

Brown bears are common on Chichagof Island, using areas from sea level to the alpine. The late summer season has been identified as the most critical or limiting period for brown bear. During this season, many brown bears concentrate along low-elevation valley bottoms and salmon streams. These are often the same areas of highest human use and most intense resource development activities. During this season, brown bears use a variety of habitats, with estuaries and riparian areas having the highest habitat value.

Streams and rivers that produce salmon, such as Indian River, have a higher value for brown bears than resident fish streams. Brown bears have not been identified as a species requiring minimum patch sizes of a particular habitat type. They are not known to have specific vegetation corridor requirements, as they travel and move through a variety of terrain and vegetation conditions (USDA Forest Service 1997a).

The Project Area currently has about 37,177 acres (excluding rock, permanent ice fields, and acres of lakes) within occupied brown bear habitat.

Increases in human activity in an area may result in increased direct human-caused deaths of bears. Average open road density is 0.38 miles of system road per square mile (see the Transportation System section). Open roads provide additional access for hunters and may indirectly cause increased harvests. However, the Northeast Chichagof Controlled Use Area (which includes all of the Project Area) is closed by ADF&G and Federal Subsistence Board regulations to the use of any motorized land vehicle for brown bear hunting (USDI 1997). According to ADF&G, there have been five sport-hunted bears taken from the Project Area since 1990, and no recorded illegal kills, wounding losses, or defense of life or property kills (Shipley 1996).

River Otter - *Lutra canadensis*

River otters are associated with coastal and fresh water aquatic environments and the immediately adjacent (within 100 to 500 feet) upland habitats. Beach characteristics affect the availability of food and cover, and adjacent upland vegetation is also important in providing cover for otters. Old-growth forests have the highest habitat value, providing canopy cover, large diameter trees and snags, and burrow and den sites. Younger successional stages provide lower quality habitat (USDA Forest Service 1997a).

The Project Area currently has about 4,330 acres of forested land (all age classes and types of conifer forests) within occupied river otter habitat. According to ADF&G, there have been no river otters trapped in the Project Area since 1990 (Shipley 1996).

Marten - *Martes americana*

Marten naturally inhabit the mainland of Southeast Alaska, and natural populations occur on Kuiu, Kupreanof, Mitkof, and Revillagigedo Islands. Some were transplanted to Chichagof Island between 1930 and 1950, to provide a furbearer for trappers (Burris and McKnight 1973). Currently, they are found in all Project Area VCUs.

Marten represent species using lower elevation old-growth forest habitats during the winter season. Winter habitat (both quantity and quality) is the most limiting factor in Southeast Alaska. Due to lower snow accumulation, habitats at lower elevations have higher value for wintering marten. Coastal habitats (beach fringe) and riparian areas have the highest value, followed by upland habitats below 1,500 feet in elevation.

The Project Area currently has about 21,569 acres of forested land (all age classes and types of conifer forests) below 1,500 feet elevation within occupied marten habitat.

Of the successional stages, old-growth forests have the highest value because they intercept snow, provide cover and denning sites, and provide habitat for prey species used by marten. Dispersal across salt water is limited, but marten are fairly mobile on land. Conifer corridors may enhance movement and dispersal (USDA Forest Service 1997a).

Marten are easily trapped and can be overharvested. Forest management activities resulting in increased access may result in the potential for overtrapping. Open roads provide additional access for trappers and may indirectly cause increased harvests (USDA Forest Service 1997a). However, the Northeast Chichagof Controlled Use Area (which includes all of the Project Area) is closed by ADF&G and Federal Subsistence Board regulations to the use of any motorized land vehicle for trapping marten (USDI 1997). According to ADF&G, there have been 82 marten trapped in the Project Area since 1990 (Shipley 1996).

The 1997 TLMP (USDA Forest Service 1997) standards and guidelines for marten identify East Chichagof Island as a high risk biogeographic province. This means that a significant amount of timber harvest has occurred in the region, resulting in the conversion of productive old-growth forest to young conifer stands. Within these stands, there is little or no residual forest structure.

When harvesting timber in such provinces, the management objective is to retain features of forest stand structure important to marten habitat use. This is done by maintaining an average of over 30 percent canopy closure, keeping some windfirm trees for future snag recruitment, and retaining down material throughout the harvest unit. It is especially important to retain these features in VCUs where over 33 percent of the productive old-growth forest has been converted to young conifer stands, or will exceed this amount after a proposed project activity.

Other less restrictive standards and guidelines apply to VCUs where less than 33 percent of the original old-growth forest has been harvested (USDA Forest Service 1997). Currently, all of the VCUs in the East Chichagof Island biogeographic province (including the Project Area) have less than 33 percent of the original old-growth forest in a harvested (second-growth or young conifer) condition (Shipley 1996).

Red Squirrel - *Tamiasciurus hudsonicus*

Before 1930, red squirrels in Southeast Alaska existed only on the mainland. In 1930 and 1931, they were introduced to Baranof and Chichagof Islands as a potential prey species for transplanted marten. Today, red squirrels are abundant on these islands (USDA Forest Service 1997a).

Red squirrels require forests with cone-producing trees and cavities in trees and snags. They represent a species which can do fairly well in seed-producing second-growth stands. Spruce trees and mature to old-growth forests have the highest habitat values for this species. Habitat usually does not exist for red squirrels above 2,000 feet in elevation.

Optimum habitat is believed to occur when patches of preferred habitat are greater than 30 acres. Approximately 98 percent of the old-growth in the Project Area is in patches greater than 30 acres. See Table 3-13 and Figure 3-4 for more information regarding patches in the Project Area. Corridors of pole timber or older stands of trees also facilitate movement and dispersal (USDA Forest Service 1997a).

The Project Area currently has about 26,325 acres of forested land (all age classes and types of conifer forests) below 2,000 feet elevation within occupied red squirrel habitat. There are no current population data available regarding red squirrels in the area.

Brown Creeper - *Certhia americana*

The brown creeper is considered an uncommon, permanent resident bird throughout Southeast Alaska. This species is associated with large old-growth trees and is most closely associated with high volume old-growth (USDA Forest Service 1997a).

Winter habitat has been suggested as the limiting factor for cavity-nesting birds, including the brown creeper. Optimum habitat use is believed to occur when patches of preferred habitat are greater than 15 acres (USDA Forest Service 1997a). Approximately 99 percent of the old-growth in the Project Area is in patches greater than 15 acres. (See Table 3-13 and Figure 3-4.)

The Project Area currently has about 8,380 acres of forested land (all age classes and types of conifer forests) within occupied brown creeper habitat. There are no current population data available regarding brown creepers in the area.

Red-Breasted Sapsucker-*Sphyrapicus ruber*

The red-breasted sapsucker is found throughout Southeast Alaska during the spring, summer, and early fall seasons. They are called primary excavators because they create cavities for other cavity-using wildlife species (USDA Forest Service 1997a). Red-breasted sapsuckers are summer residents which use old-growth forest habitats with snags. The quantity of snags has a direct relationship to the number of red-breasted sapsuckers within an area. Old-growth forests provide the best snag habitat over the long term, with the low volume strata of old-growth receiving more use than high volume strata. Optimum habitat use is believed to occur when patches of preferred habitat are greater than 250 acres

(USDA Forest Service 1997a). Approximately 95 percent of the old-growth in the Project Area is in patches greater than 250 acres. (See Table 3-13 and Figure 3-4.)

The Project Area currently has about 24,071 acres of forested land (all age classes and types of conifer forests) within occupied red-breasted sapsucker habitat. There are no current population data available regarding red-breasted sapsuckers in the area.

Hairy Woodpecker - *Picoides villosus*

The hairy woodpecker is considered an uncommon, permanent resident throughout Southeast Alaska. Like the red-breasted sapsucker, hairy woodpeckers are primary cavity excavators for other cavity-using wildlife species (USDA Forest Service 1997a).

Hairy woodpeckers use old-growth forest habitats with snags and partially dead trees for foraging and nesting. Their winter habitat may be the most limiting for them. Snag quantity has a direct relationship with the potential for an area to support hairy woodpeckers. Old-growth forests provide the best long-term snag habitat, with high volume old-growth stands receiving more use than low-volume stands. Optimum habitat use is believed to occur when patches of preferred habitat are greater than 500 acres (USDA Forest Service 1997a). Approximately 94 percent of the old-growth in the Project Area is in patches greater than 500 acres. (See Table 3-13 and Figure 3-4.)

The Project Area currently has about 17,190 acres of forested land (all age classes and types of conifer forests) within occupied hairy woodpecker habitat. There are no current population data available regarding hairy woodpeckers in the area.

Bald Eagle - *Haliaeetus leucocephalus*

North America's bald eagle population is at its highest density in Southeast Alaska. Here the bald eagle population was estimated in 1992 to be over 13,000 adult birds. Over 8,000 nest sites were identified as of 1996 (USDA Forest Service 1997a). Bald eagle nesting habitat is primarily old-growth trees along the coast and within riparian areas.

The Project Area currently has about 2,840 acres of forested land (all age classes and types of conifer forests) within occupied bald eagle habitat.

The U.S. fish and Wildlife Service (USFWS) and Forest Service maintain an interagency agreement for bald eagle habitat management in the Alaska Region, which includes standards and guidelines for regulating human disturbance within identified bald eagle use areas. For example, all identified eagle nest trees are surrounded by a minimum 330-foot radius protective habitat management zone (USDA Forest Service 1997a). The USFWS has identified twelve nest sites in the Indian River Project Area. Table 3-15 displays the number of identified eagle nest trees and the VCU in which they are located.

Table 3-15
Number of Eagle Nests by VCU

VCU	Nests within Project Area
2201	2
2210	9
2221	1
Total	12

Source: Shipley 1996

Consumptive Use of Wildlife

A number of wildlife species on the Tongass are important for subsistence and sport hunting, and some for trapping. Sitka black-tailed deer, brown bear, marten, river otter, and waterfowl are hunted and trapped in the Project Area. Bag limit and seasons are managed by the ADF&G and Federal Subsistence Board for sport and subsistence uses, respectively (USDA Forest Service 1997a).

Sitka black-tailed deer are by far the most important and harvested terrestrial wildlife species for subsistence purposes and for sport hunting. Subsistence and sport hunting for deer and, to a lesser extent, other wildlife are very closely related activities in the Project Area. See the Subsistence sections in Chapters 3 and 4 of this EIS for more information on subsistence and sport uses of deer and other wildlife.

Population Viability

Fish and wildlife habitat must be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. A viable population is one that has the estimated numbers and distribution of reproductive individuals needed to ensure its continued existence, and is well distributed in the planning area (NFMA 1976).

(Note: A "planning area" for determining viable populations is the ecological province level (USDA Forest Service 1991). See Table 3-1 for ecological level summary.)

In order to maximize the probability that viable populations will be maintained over time, habitat must be provided to support at least a minimum number of reproductive individuals. In addition, the habitat must be well distributed so that those individuals can interact with others in the planning area.

The 1997 TLMP identified development and non-development land use designations (LUDs) that provide habitat to maintain viable, well-distributed populations of desired vertebrate species. Examples of development LUDs include Timber Production and Modified Landscape (see Table 1-2). Examples of non-development LUDs are Wilderness and Old-growth Habitat. Across the Tongass National Forest, 22.4 percent of the acres are in development LUDs, while 77.6 percent are in non-development LUDs.

In addition, the standards and guidelines identify other non-development areas, such as beach and estuary fringes and stream buffers, that also provide habitat and travel corridors, further reducing risks to wildlife population viability. (See 1997 TLMP EIS, pages 3-380 and 3-381 for additional information.)

None of the past management activities in the Project Area have substantially increased the risk that viable populations will not be maintained over time. In addition, habitats and connections between habitats have not been fragmented to such a high degree that the distribution of species has been measurably affected.

Threatened, Endangered, and Sensitive Species

Endangered Species Act of 1973

The Endangered Species Act of 1973 was enacted "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species...." Table 3-16 displays the threatened, endangered, and species of concern listed by the U.S. Fish and Wildlife Service (terrestrial animals and plants), National Marine Fisheries Service (marine animals), and U.S. Forest Service - Alaska Region (sensitive animals and plants) that may be in or near the Project Area.

Table 3-16
Threatened, Endangered, Species of Concern, and Sensitive Species Which May Occur in the Indian River Project Area

Common Name	Scientific Name	Federal Status	Alaska Region Status
Humpback whale	*Megaptera novaengliae*	E	--
Steller sea lion	*Eumetopias jubatus*	T	--
American peregrine falcon	*Falco peregrinus anatum*	E	--
Marbled murrelet	*Brachyramphus marmoratus*	C	--
Harlequin duck	*Histrionicus histrionicus*	C	--
Northern goshawk	*Accipiter gentilis*	C	S
Olive-sided flycatcher	*Contopus borealis*	C	--
Osprey	*Pandion haliaetus*	--	S
Trumpeter swan	*Cygnus buccinator*	--	S
Peale's peregrine falcon	*Falco peregrinus pealei*	--	S
Ascending moonwort	*Botrychium ascendens*	C	--
Goose-grass sedge	*Carex lenticularis* var. *dolia*	C	S
Norberg arnica	*Arnica lessingii* ssp. *norbergii*	--	S
Pretty shooting star	*Dodecatheon pulchellum* ssp. *alaskanum*	--	S
Kamchatka rockcress	*Draba kamtschatica*	--	S
Davy mannagrass	*Glyceria leptostachya*	--	S
Wright filmy fern	*Hymenophyllum wrightii*	--	S
Truncate quillwort	*Isoetes truncata*	--	S
Calder lovage	*Ligusticum calderi*	--	S
Choris bog orchid	*Platanthera chorisiana*	--	S
Bog orchid	*Platanthera gracilis*	--	S
Loose-flowered bluegrass	*Poa laxiflora*	--	S
Kamchatka alkali grass	*Puccinellia kamtschatica*	--	S
Unalaska mist-maid	*Romanzoffia unalaschcensis*	--	S
Queen Charlotte butterweed	*Senecio moresbiensis*	--	S
Circumpolar starwort	*Stellaria ruscifolia* ssp. *aleutica*	--	S
Northern rockcress	*Draba borealis* var. *maxima*	--	S

Sources: USFWS 1996a, NMFS 1996, USDA Forest Service 1995c
E= Endangered Species: is in danger of extinction throughout all or a significant portion of its range.
T= Threatened Species: is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
C= Species of Concern (former Category 2 Candidate species): species for which there is some evidence of vulnerability, but for which there are not enough data to support a listing proposal at this time.
S= Sensitive species: species that is considered sensitive due to its behavior or critical life cycle component that may be affected or is considered sensitive through its association with a habitat type that is particularly sensitive.

Wildlife

The humpback whale was Federally listed as endangered in 1970 and occurs in most of the marine waters of Southeast Alaska. There is no designated critical habitat nor is there any area being considered for designation as critical habitat in or near the Project Area (Shipley 1996a).

The Steller sea lion was designated as threatened on April 5, 1990. This species may occur near the Project Area. However, no critical habitats are designated in or near the Project Area at this time (Shipley 1996a).

Marbled murrelets are common in Southeast Alaska and are known to occur in the Project Area. These sea birds nest on branches of old-growth coniferous trees. Nesting surveys have been conducted in the Project Area. Nearshore marine surveys and dawn watches were conducted in the Project Area by Forest Service biologists in 1994 and 1995. A total of 881 marbled murrelet detections were recorded in both years. The Biological Assessment and Biological Evaluation in Appendix B and the Planning Record contain additional information regarding marbled murrelet surveys and results.

Northern goshawks nest in old-growth forest stands in Southeast Alaska. In an effort to avoid timber harvest near goshawk nesting sites, Forest Service biologists conducted surveys of proposed timber harvest units and road locations. Surveys were conducted in 1994 and 1995. The Biological Assessment and Biological Evaluation in the Planning Record contain additional information regarding goshawk surveys and results. A goshawk was seen in the 10-Mile Creek drainage in 1993 and 1995. In 1995, a plucking post, two inactive nest sites, and a possible goshawk response to recorded calls were documented in the Freshwater Creek drainage.

At least three harlequin ducks were observed in the Indian River estuary in September 1997. No other observations in the Project Area have been recorded. Although olive-sided flycatcher, osprey, trumpeter swan, or Peales or American peregrin falcons may occur in the Project Area, none of these species are known to occur there.

Fish

There are no Federally listed threatened, endangered, or sensitive fish species known to occur in the Project Area.

Plants

There are no Federally listed or proposed threatened or endangered plant species known to occur in the Project Area.

There are 22 vascular plants designated as sensitive by the Regional Forester for the Alaska Region (Region 10). Of these plants, 16 are known or suspected to occur on the Sitka and Hoonah Ranger Districts and possibly in the Project Area. They are known or suspected to occur because of their range and/or general habitat requirements. In addition to these, the following plant species may be added to the R-10 sensitive species list in the future:

- Smooth-fruited netleaf willow, *Salix reticulata* ssp. *glabellicarpa*
- Ascending moonwort, *Botrychium ascendens*
- Undescribed moonwort, *Botrychium* sp.

The Forest Service conducted surveys in 1995 and 1996 for sensitive plants in the Project Area. Several proposed new road corridors and harvest units with high probability of sensitive plant occurrence in the Project Area were surveyed. High probability sites generally include alpine/sub-alpine habitat, muskegs, swales, meadows (upper beach, dry or wet meadows), streamsides, lake margins, and rock outcrops. Several populations of choris bog orchid were located in the Project Area, in proposed units and along proposed road corridors. Survey protocols, results, and the risk assessment are documented in the Biological Evaluation for plants (Trull 1996a).

Timber

Project Area Land Base by Timber Classification

The Indian River Project Area contains 35,723 acres of National Forest System lands. These lands are classified as either forest land or non-forest land. Forest land is defined as having at least 10 percent tree cover, and accounts for roughly 62 percent (21,999 acres) of the Project Area. The remaining 38 percent (13,724 acres) of the land base is classed as non-forest land. Non-forest lands include estuarine tidal flats, shrub riparian areas, muskegs, meadows, alpine areas, brushfields, rock outcrops, and freshwater lakes.

Forest Land

Forest land producing or capable of producing crops of industrial wood is classified as productive forest land (also called timberland). These lands can produce more than twenty cubic feet of wood per acre per year (USDA Forest Service 1997). Old-growth and second-growth qualify. This includes stands established following natural disturbances or logging. About 38 percent (13,608 acres) of the land in the Project Area is productive forest.

Non-productive forest land is forest land that is incapable of producing commercial quantities of timber. Approximately 24 percent (8,392 acres) of the Indian River Project Area is non-productive forest land.

Table 3-17 summarizes the area of forest (productive and non-productive) and non-forest land in the Project Area. Acres here and throughout this section are derived from the Chatham Area timber data base, updated in 1993 - 1994 through field reconnaissance and photo interpretation.

Table 3-17
Project Area Landbase (Acres)

VCU	Non-Forested	Non-Productive Forest	Productive Forest	Total
2041	193	341	215	749
2160	3,655	3,364	3,466	10,483
2200	6,759	2,834	5,324	14,917
2210	1,259	494	2,543	4,296
2221	1,859	1,359	2,060	5,278
Total	13,724	8,392	13,608	35,723
Percent of Total	38	24	38	100

Source: Regan and Peterson 1996

Tentatively Suitable Forest Land

Productive forest land is classified as either tentatively suitable or not tentatively suitable for timber harvest. In order to be tentatively suitable, forest land must:

- Be capable of harvest with available technology to ensure timber production without irreversible resource damage to soil productivity or watershed conditions;
- Have a reasonable assurance that the area can be restocked after final harvest;
- Not be withdrawn from timber production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service; and
- Have adequate information available to project responses to timber management activities (USDA Forest Service 1997).

Timber Strata. Three volume strata (low, medium, and high) are distinguished for productive forest land, by using the existing inventory (TIMTYP) and additional information on soils and slopes (USDA Forest Service 1997). Chatham Area volumes per acre for the timber strata are displayed in Table 3-18.

Table 3-18
Timber Volume Strata

Volume Strata	Chatham Area Average Volume per Acre (mbf)*
Low	9.4
Medium	19.2
High	30.4

Source: USDA Forest Service 1997 * Net sawlog + utility, Bureau Long Log Scale.

Table 3-19 shows the acreage by volume strata and VCU of tentatively suitable forest land in the Indian River Project Area. The 8,050 acres of available tentatively suitable lands shown in the table represent the total land base from which harvest units can be proposed under this project. Of the tentatively suitable acres, those not available for harvest include the following lands:

- lands with less than 8 mbf per acre;
- lands within LUDs where programmed timber harvest is not allowed (e.g., Old-growth LUDs);
- lands within the 1,000-foot beach fringe; and
- lands within Riparian Management Areas.

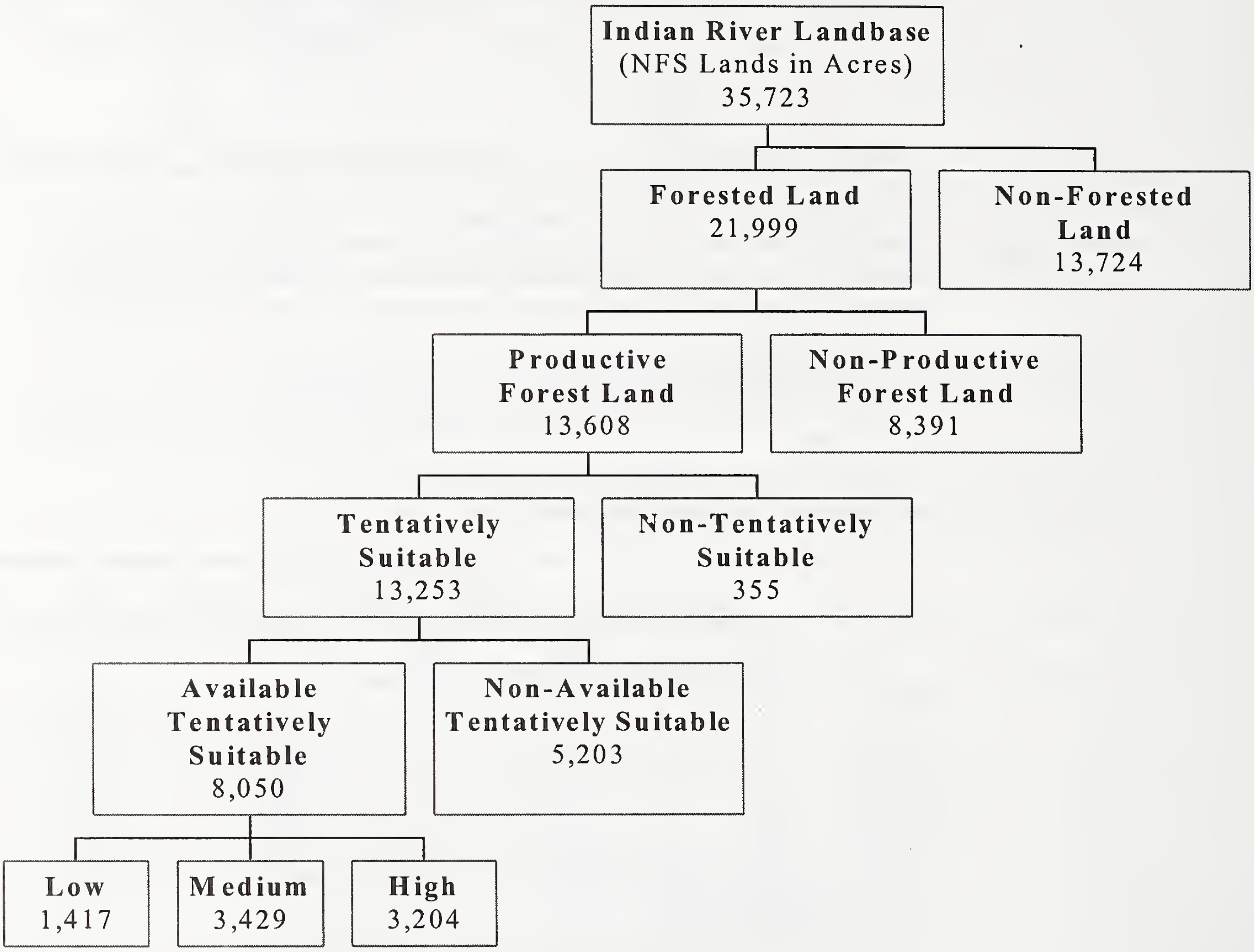
Table 3-19
Acres of Tentatively Suitable Land by Volume Strata

VCU	Low Volume	Medium Volume	High Volume	Other *	Total
2041	3	87	115	0	205
2160	879	1,516	979	481	3,855
2200	1,111	1,714	1,779	704	5,308
2210	0	544	955	413	1,912
2221	42	917	748	266	1,973
Total	2,035	4,778	4,576	1,864	13,253
Total Available	1,417	3,429	3,204	0	8,050

Source: Regan and Peterson 1996
* Areas with less than 8 mbf per acre (seedling, sapling, and pole timber).

Figure 3-5 Timber Land Classification Process for this Project.

Indian River Landbase



Species Composition of Forest Lands

Western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*) dominate timber stands throughout much of the Project Area. Alaska-cedar (*Chamaecyparis nootkatensis*) is an important associated species found in conjunction with the hemlock and spruce. Other tree species include red alder (*Alnus rubra*), mountain hemlock (*Tsuga mertensiana*), and lodgepole pine (*Pinus contorta*). The commercial species composition of the Project Area is 82.6% western and mountain hemlock, 14.8% Sitka spruce, and 2.6% Alaska-cedar.

In general, spruce and hemlock are found on the better-drained, more productive sites on the lower and upper slopes within the Project Area. Spruce occupy much of the valley bottoms. Timber harvest in some of these areas has changed their composition from spruce-dominated plant associations to red alder-dominated associations, although most are returning to predominantly spruce and hemlock.

Alaska-cedar is typically found in conjunction with hemlock on lower and upper slopes, and also on poorly-drained sites such as muskegs that occur within the Project Area. Alaska-cedar typically occurs as a minor component on the better-drained sites. Its ability to regenerate and successfully compete with hemlock on these sites is limited because it has less tolerance to shade. On sites with poorer drained soils, Alaska-cedar is often found in greater numbers, and in many cases may be the dominant tree species. The ability of Alaska-cedar to successfully regenerate and compete in areas of high water tables and poorer soil drainage makes this species an important component of these sites.

Red alder is found along roads and streams and occasionally on steeper slopes where soils have been highly disturbed by natural events and processes or by human activities. Red alder is not considered a commercial species in Southeast Alaska.

Lodgepole pine (also called shore pine) is considered a commercial species throughout much of its range in the western United States. However, lodgepole pine is rarely harvested in Southeast Alaska because it seldom meets merchantability standards.

Past Timber Harvest

The timber harvested to date within the Indian River Project Area has been from old-growth stands. Commercially harvested species include western and mountain hemlock, Sitka spruce, and Alaska-cedar. Table 3-20 summarizes the acreage previously harvested in the Project Area. Almost all of these harvested areas were clearcut using the highlead yarding method, or (prior to 1970) A-frame structures.

Table 3-20
History of Timber Harvest Acres by VCU

VCU	Pre-1961	1961-1970	1971-1980	1981-1990	1991-1994	Total
2041						0
2160			34	572		606
2200	1		593	230		824
2210	112	348				460
2221				331		331
Total	113	348	627	1,133	0	2,221

Source: Regan and Peterson 1996

Precommercial Thinning of Past Harvest Stands

Precommercial thinning involves the selective removal of trees from second-growth stands that are 15 to 25 years old. Thinning reduces competition among trees in the stand, which stimulates growth of the remaining trees. Precommercial thinning may also control species composition, improve windfirmness, improve forest vigor and health, and maintain an open understory, thereby extending the time period when understory browse species suitable for wildlife is available. Table 3-21 summarizes past precommercial thinning within the Project Area. In addition, approximately 209 acres of second-growth have been identified for precommercial thinning treatments over the next 5 years.

Table 3-21
Past Precommercial Thinning

VCU	Acres	Name
2210	147	Whip Station
2221	154	10-Mile Creek
Total	301	

Source: Chatham Area SIS database.

Subsistence

For many rural southeast Alaska residents, subsistence use of natural resources on the Tongass National Forest is a way of life. Through subsistence, these people are able to maintain their physical health and well-being, as well as their economic, cultural, and social existence. Subsistence activities include:

- hunting for deer, bear, marine mammals, and birds;
- digging clams, catching fish and shellfish (salmon, shrimp);
- harvesting marine invertebrates (sea cucumbers);
- trapping furbearers (marten);
- collecting firewood;
- collecting herring eggs;
- collecting berries and edible plants and roots.

Subsistence goods may be eaten, traded, given away, or made into an item of use or decoration.

The taking of fish and wildlife on public lands for subsistence uses is restricted to Alaska residents of rural areas or rural communities. The Alaska National Interest Lands Conservation Act (ANILCA) provides for "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on public lands." It also legislates that "customary and traditional" subsistence uses of the renewable resources "shall be the priority consumptive uses of all such resources on the public lands of Alaska." Non-rural residents are not provided a preference for the taking of fish and wildlife on public lands. Juneau and Ketchikan have been determined to be non-rural by the Federal Subsistence Board.

Subsistence resources are inventoried and assessed in terms of:

- **Abundance and distribution.** This refers to the resource supply (how much is there) and how much is needed to satisfy demand.
- **Competition.** This refers to who is using the resource, by community.
- **Access.** This refers to the ability and methods used by subsistence resource users to enter the Project Area. Access may be increased by road and LTF construction or reduced by Road Management Objectives that restrict motorized vehicle access.

Abundance and Distribution

The Sitka black-tailed deer is the most important subsistence resource in the Project Area that may be affected by management activities, and so is the focus of the following discussion. No other subsistence resource is expected to be adversely affected by timber management activities. (See the wildlife sections in Chapters 3 and 4 for additional information on deer and other species used for subsistence purposes.)

A habitat suitability index model was used to estimate deer populations based on habitat capability. Table 3-22 displays estimated habitat capability in Wildlife Analysis Areas (WAAs) 3525 and 3526. (Note: WAAs are management units delineated by the ADF&G. The Project Area encompasses part of WAAs 3525 and 3526, and a very small portion of WAA 3523. See Figure 3-6.)

The table displays and compares deer supply and demand from harvest rates, hunter demand, and Alaska Department of Fish and Game (ADF&G) population objectives. Hunter demand was determined from ADF&G hunter questionnaires, and refers to the number of deer hunters would like to be able to harvest. ADF&G population objectives were developed as the number of deer the Department would like to have in each WAA.

Figure 3-6 Map of Wildlife Analysis Area

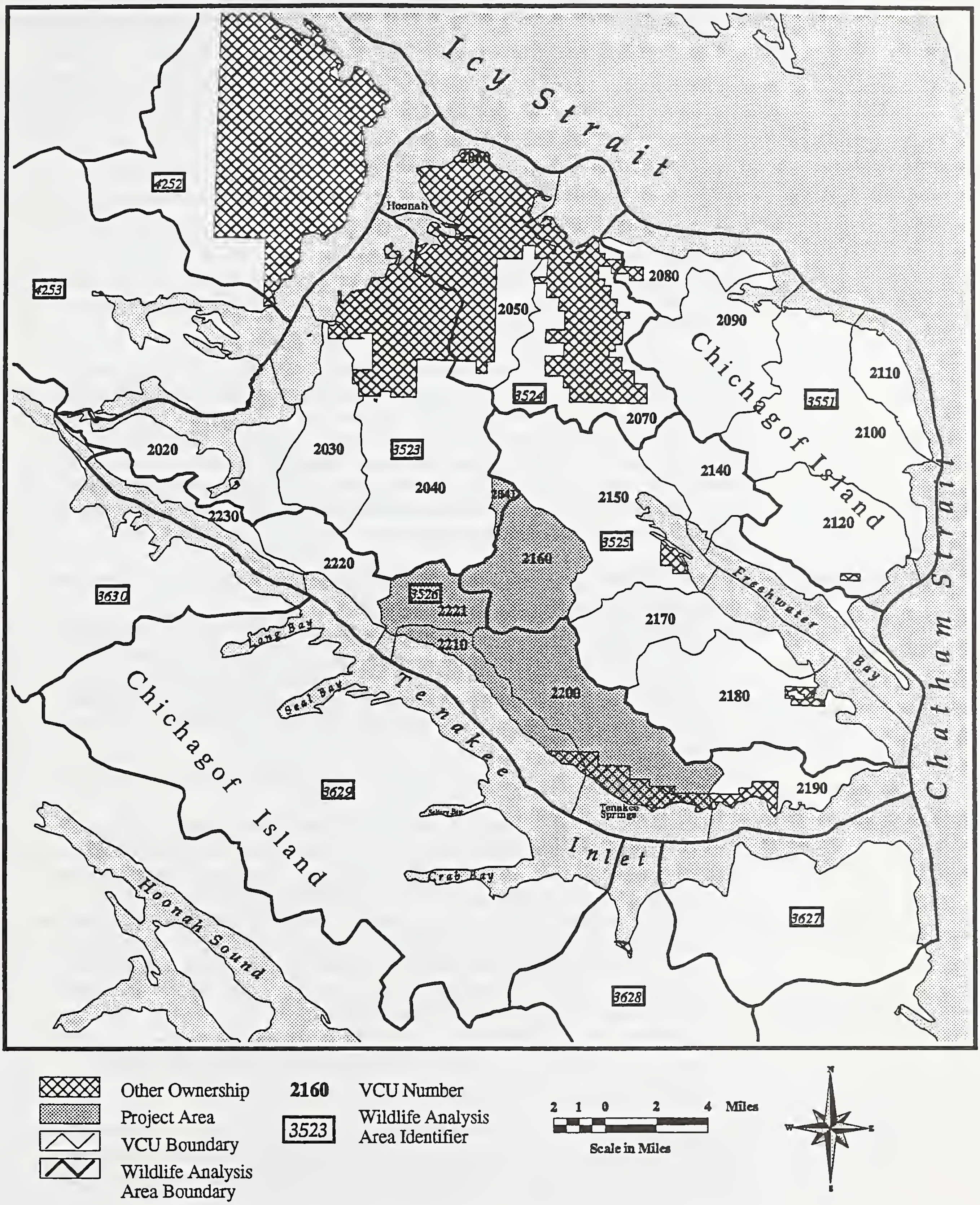


Table 3-22
Deer Supply and Demand, by Wildlife Analysis Area (WAA)

WAA	Mean # Deer Harvested from WAA Annually	Mean Habitat Capability to Maintain Harvest Rate *	Hunter Demand Harvest Level	Hunter Demand Habitat Capability *	1992 ADF&G Population Objectives	1996 Deer Habitat Capability **
3525	194	1,940	228	2,280	2,149	2074
3526	184	1,840	260	2,598	1,213	1480

Source: Shipley 1996
*Estimated habitat capabilities based on 10 times the harvest rate, in order to maintain sustainable harvest rate of 10 percent per year.
** Habitat capabilities estimated by the habitat suitability index model.

Currently, WAA 3525 appears to have sufficient habitat capability to maintain the mean deer harvest and ADF&G population levels, but not the hunter demand level. This indicates that, unless there is an event that seriously reduces deer populations (e.g., severe winter, disease outbreak, etc.), there currently is no significant possibility of a significant restriction on subsistence uses in this WAA.

In WAA 3526, the current habitat capability and ADF&G population objectives appear to be in agreement. However, the estimated deer population (1,840 deer) needed to sustain the mean harvest rate (184 deer) in this WAA exceeds the estimated habitat capability by 20 percent. This indicates that a significant possibility of a significant restriction on subsistence uses may currently exist in this WAA. It should be noted that harvest levels in this WAA have been above habitat capability for many years, and there is no indication that overharvest is occurring. Harvest trends should be closely monitored to determine if in fact too many deer are being harvested from this WAA.

Competition

Communities were selected for inventory according to criteria suggested by J. Kruse (draft Guide to 810 Analysis, 1993). These criteria include:

- Deer constitute at least 10 percent of the total subsistence harvest of the community, and the community obtains at least 10 percent of the deer they harvest from WAAs associated with the proposed project. Table 3-23 displays communities harvesting deer in Project Area WAAs during 1990-1995. Appendix F displays the geographic extent of regional subsistence use for Southeast Alaska and community subsistence use maps.
- The community reports some use of the acreage of Project Area WAAs for marine resource harvesting. Appendix F displays these maps.
- The community has historically used the area. Goldschmidt and Haas (1946) identified the land-use patterns associated with Native communities that existed in the mid-twentieth century in Southeast Alaska. Comparing their maps with information from the 1987 Tongass Resource Use Cooperative Survey (TRUCS) maps and ADF&G Subsistence Division maps, it appears that hunting and fishing use by Natives in Southeast Alaska is still tied to some extent to historic traditions of who may hunt and fish on certain lands. Based on this work, historical clan hunting boundaries of the Angoon and Hoonah Tlingit are the only communities that have traditional use areas within the Project Area. (See Appendix F maps.)
- The community has gained increased access to the area for deer hunting as a result of new roads connecting the community to the harvest area, or roads connecting the harvest areas to a ferry terminal that could be used by the community.

Communities that best meet these criteria are Angoon, Hoonah, Juneau, and Tenakee Springs. Although not a rural subsistence community, Juneau is included in the inventory due to the large percentage of deer Juneau hunters harvest from Project Area WAAs and because of its access to the area via the ferry system.

Table 3-23
Communities reporting Harvesting Deer in Project Area WAAs During Regulatory Years 1990-1995

Community	Mean # Deer from WAA 3525	Mean # Deer From WAA 3526	Percent of Community's Deer	Mean # Deer From Project Area WAAs	Percent of Project Area WAAs Deer
Haines	0	3	<1	2	<1
Hoonah	60	0	10	8	6
Hyder	9	0	13	1	<1
Juneau	50	130	3	86	64
Kassan	1	11	4	7	5
Kennel Creek	14	0	67	2	1
Ketchikan	4	0	<1	1	<1
Laboucher Bay	4	0	3	1	<1
Other Alaska	4	4	N/A	3	2
Outside Alaska	<1	0	N/A	<1	<1
Petersburg	0	<1	<1	<1	<1
Sitka	12	3	<1	4	3
Skagway	1	0	7	<1	<1
Skow/Polk	4	0	2	<1	<1
Tenakee Springs	4	33	21	21	16
Texekan	0	<1	13	<1	<1
Whitestone	5	0	<1	<1	<1
Total	172	184	N/A	135	100%

Source: Shipley 1996
Note: Numbers are rounded to nearest whole figure. N/A = Not Applicable

Angoon Subsistence Use

Subsistence hunting and fishing are a vital source of food in Angoon and an important part of the lifestyle and culture. The average Angoon household derived 46 percent of its meat from subsistence harvests. Deer accounted for 31 percent of the subsistence harvest (ADF&G 1994).

ADF&G hunter survey data indicate that Angoon residents harvested no deer from the Project Area during the period 1990-1995 (Shipley 1996).

Hoonah Subsistence Use

In surveys reporting 1985 and 1987 harvest, 100 percent of 237 Hoonah households reported harvesting and using subsistence resources.

The average Hoonah household derived 50 percent of its meat from subsistence harvest, including approximately 93 pounds of deer. Deer accounted for 23 percent of the total subsistence harvest.

ADF&G hunter survey data indicate that Hoonah residents harvested a mean of 10 percent of their total deer harvest from the Project Area during the period 1990-1995. Harvest is reported in four of those five years. Annual harvest ranged from 0 to 13 percent during that time period. On average, Hoonah's harvest accounts for 6 percent of the harvest from Project Area WAAs. Harvest was reported only from WAA 3525 (Appendix F).

Tenakee Springs Subsistence Use

One hundred percent of 47 Tenakee Springs households reported using subsistence resources in 1987.

The average Tenakee Springs household derived 42 percent of its meat and fish from subsistence gathering in 1987, including 135 pounds of deer. Deer comprised 39 percent of the subsistence harvest (Shipley 1996).

ADF&G hunter survey data indicate that residents of Tenakee Springs harvested a mean of 21 percent of their total deer harvest from the Project Area during the period 1990-1995. Harvest was reported in all five years. Annual harvest ranged from 10 to 32 percent during that period of time. On average, Tenakee Springs' harvest accounts for 16 percent of the deer harvest from Project Area WAAs. Harvest was reported in both WAAs 3525 and 3526.

Juneau Sport Hunting

ADF&G hunter survey data indicate that Juneau residents harvested a mean of 3 percent of their total deer harvest from the Project Area during the period 1990-1995. Harvest occurred in all of those years. Annual harvest ranged from less than one to over 7 percent during that period of time. On average, Juneau harvest accounts for 64 percent of the harvest from Project Area WAAs. Juneau residents report harvesting deer in both Project Area WAAs, with the majority of deer coming from WAA 3526 (Shipley 1996).

Access

The Project Area is accessed by boat, off-highway vehicles (ATV), foot travel, and occasionally by small truck. The City of Tenakee Springs is accessed by boat, floatplane, and the Alaska Marine Highway System.

See the Transportation section in this chapter for detailed information on roads accessing the Project Area. The gates on the Indian River Road (FS Road #7500) are not closed at this time. However, the Northeast Chichagof Controlled Use Area (which includes all of the Project Area) is closed by ADF&G and Federal Subsistence Board regulations to the use of any motorized land vehicle for brown bear hunting, or for the taking of marten, mink, or weasel. This restriction is in place to prevent over-harvest.

Tenakee Springs hunters travel an average of seven miles to their most reliable deer hunting areas. They are less likely to hunt in areas that include clearcuts of any age, roads, or areas above tree line. They are more likely to hunt in areas that include old-growth forest, muskeg, grassy meadows, or open beaches (Kruse and Frazier 1988).

Recreation

The Indian River Project Area encompasses many of the natural recreation attraction features of Southeast Alaska. These features include estuaries, mountains, large freshwater drainages, rocky shorelines with gravel beaches, and abundant wildlife and fisheries. The area also contains a developed recreation infrastructure in Tenakee Springs, including a road system, trails, Alaska Marine Highway and daily floatplane access, cabins, and recreational equipment rental businesses (boats, kayaks, bikes).

The recreation resources of the Project Area are spread over approximately 61 square miles. The vegetation attractor is a mix of Sitka spruce, western and mountain hemlock, Alaska yellowcedar, and red alder, with a small amount of black cottonwood. Blueberry, devil's club, and skunk cabbage are prevalent in the understory vegetation.

A portion of the Project Area is on non-National Forest System lands. All of the salt water shorelines in the Indian River VCU (VCU 2200) are on land owned by either the State or the City of Tenakee Springs. This includes the Indian River estuary, located 1.5 miles east of the city. Twenty percent of the shoreline in the Whip Station VCU (VCU 2210) is also on State or City lands. Land owners in the area allow free use of their lands to recreationists and provide entry onto the National Forest.

The existing recreation situation in the Project Area, described in this section, is derived from the following information sources:

- Home Range
- Recreation Opportunity Spectrum (ROS)
- Recreation Places, Activities, and Sites Inventories
- Road Management Objectives (RMO)
- Wild and Scenic Rivers
- Recreation Special Interest Areas
- Roadless Inventory
- Recreation Special Use Permits (SUP)

Recreation Use

The area within an approximately 15 to 30 mile radius of a community in Southeast Alaska is called the community's "home range" (see Glossary). The Project Area is within the home range of the City of Tenakee Springs. A ridge system and one air mile separate the town from the harvest area. All of the saltwater shorelines of the Indian River Project Area also lie within Tenakee Springs' home range.

Tenakee Springs has a population of 100 people (1997 TLMP). The community considers itself unusual because members have agreed to limit their personal freedoms to maintain a certain lifestyle. Such limitations include prohibiting personally owned automobiles within the city, establishing set hours for using the natural hot-springs pool, and continuous dedication to remaining an isolated community. Tenakee Springs residents emphasize their uniqueness when advertising for tourism, because they feel the unusual sells well and generates more economic income to stabilize their community (Nelson 1996).

Table 3-24 displays recreation uses by residents and tourists of Tenakee Springs in the Project Area. The areas of saltwater adjacent to the Indian River and 10-Mile Creek estuaries are used for personal fishing (halibut, rockfish, salmon, snapper, crab, and shrimp) and whale watching. Pods of whales have been documented bubble feeding in these areas. Many different types of recreational boating also occur in these off-shore zones (yachts, power boats, skiffs, and kayaks) (Nelson 1996).

Portions of the East and West Tenakee Trails are within the Project Area, but located on City and State lands. These trails are an integral part of the recreation experience for residents and tourists. Trails are used as local transportation routes and for recreational walking or hiking, but also to access National Forest lands where many other types of recreation are experienced. Residents tend to use the trails in the winter, and tourists during spring, summer, and fall.

Besides the trail being a recreation attractor in itself, there are also a bear viewing area, a picnic shelter, and a number of waterfalls on or near the trail. The bear viewing area starts at the picnic shelter and the East Tenakee Trail bridge, and continues for 1.25 miles through a series of five waterfalls (Nelson 1996). The falls vary in width from 50 to 100 feet, and drop 42 feet in one mile, creating a visually exciting area.

Table 3-24
Recreation Uses by Tenakee Springs Residents and Tourists

Recreation Activity	VCU 2041	VCU 2160	VCU 2200	VCU 2210	VCU 2221
Indian River freshwater fishing			X		
Wildlife bear viewing			X		
Subsistence and sport hunting		X	X	X	X
Mountain biking		X	X		X
Walking East Tenakee Trail and Indian River Road			X		
Walking West Tenakee Trail				X	
Berry picking			X	X	X
Cross-country skiing			X	X	
Natural food gathering			X		
Picnicking			X	X	
Cave exploration		X	X		X
Camping		X	X		
Driving Indian River Road		X	X		X

Source: Nelson 1996

Recreation Opportunities

Recreation opportunities in the Indian River Project Area were inventoried using the Recreation Opportunity Spectrum (ROS). The ROS was developed by the Forest Service to analyze and describe various recreation experiences and is based, in part, on the extent to which the natural environment has been modified. (See Glossary for a complete definition of ROS.) ROS classes in the Project Area range from Semi-primitive Non-motorized (28,346 acres) to Roaded Modified (7,014 acres). In areas classed as Semi-primitive Non-motorized, a recreationist would have a high probability of experiencing solitude, challenge, and risk. On the other hand, a visitor to an area classified as Roaded Modified would find the landscape dominated by vegetation alterations from previous harvesting and roading, with little challenge or risk. See Table 3-25 and Appendix G, Recreation Existing Situation Map.

The ROS inventory is also applied using miles of shoreline on National Forest lands within the Project Area. This provides a baseline for changes in different types of recreation opportunities directly adjacent to saltwater. Whip Station and 10-Mile VCUs have nine miles of saltwater shorelines; pebble beaches in the area are steep, with little protection from stormy weather. Seventy-eight percent of the National Forest shoreline miles are classified as altered by harvesting, with the rest (22 percent) considered available for a Semi-primitive Motorized experience. Most harvest units have not been thinned and have closed canopies with trees 30 feet high (Nelson 1996). Textural differences still visually define these harvested areas from the rest of the forest. The recreation opportunities are limited within these stands because of the density of tree growth and residual slash.

Table 3-25
Project Area Acreage by Recreation Opportunity Spectrum (ROS) Classifications (Acreages shown are National Forest land only)

ROS Class	Project Area NF Acres / % of total	VCU 2041* Acres / %	VCU 2160 Acres / %	VCU 2200 Acres/ %	VCU 2210 Acres / %	VCU 2221* Acres / %
SPNM (Semi-primitive non-motorized)	28,346 79%	750 100%	8,506 81%	12,043 81%	2,928 68%	4,119 78%
SPM (Semi-primitive motorized)	392 1%	0	0	0	297 7%	95 2%
RM (Roaded modified)	7,014 20%	0	1,977 19%	2,901 19%	1,071 25%	1,065 20%

Source: Nelson 1996
* Partial VCUs.
Note: See Glossary for detailed definitions of ROS classifications.

Recreation Places and Recreation Sites

Recreation Places are areas that have natural characteristics which attract people. Recreation Sites are specific sites or facilities within a Recreation Place. (See Glossary for complete definitions.) Two Recreation Places totaling 3,545 acres, and five Recreation Sites are located within the Project Area (see Table 3-26 and maps in Appendix G).

The Indian River Road System Recreation Place (#31,120.01) follows the corridor of the Indian River Road from Sunny Cove through the Indian River and Upper Freshwater drainages, and into the 10-Mile Creek drainage. The road was built for timber harvesting in the late 1970s, and now is the main attractor in this Recreation Place. Although seven percent of the acreage in VCUs along the road system has been harvested, the area is still used for many different types of recreation activities.

The Sunny Cove anchorage is one of four Recreation Sites in the Indian River Road System Recreation Place. This anchorage allows people to leave their boats in relative safety while they access the Indian River Road.

Travelers on the road from Sunny Cove into the Indian River drainage can commonly view wildlife. Brown bear can be seen eating berries and grass along the road. Beaver ponds and the braided stream beds of the river are visible to the west, 3.5 miles from the coast. Much of the forest is at a climax stage, with snags and breakage common, and black cottonwood lending unusual variety to the forest background. This area gives the viewer an impression of meadows intermixed with small lakes. Impressive timbered, vertical cliffs are prevalent to the northeast, next to the road.

Besides viewing scenery, recreationists make use of dispersed campsites in this area. The existence of limestone throughout the area and a cave also provide the recreation opportunity for karst exploration.

Along the next eight miles to the north, bright green alpine scenery is frequently seen in the summer. The road climbs in elevation, crossing through passes to enter the 10-Mile Creek and Upper Freshwater Creek drainages. The area gives the viewer the feeling of an open, rolling landscape not often experienced in Southeast Alaska.

The southern slope of a large limestone mountain ("the Vortex") is an impressive landmark feature of the area which can be viewed from the road throughout much of the drainage.

Table 3-26
Project Area Recreation Places, Activities, and Site Inventories

Recreation Place No. Local Name ROS Class	Activities	Sites
#31,120.01 Indian River Road System Roaded Modified (RM) 3,417 total acres VCU 2200: 1,714 acres VCU 2160: 1,124 acres VCU 2221: 590 acres	Viewing scenery Viewing wildlife Motorbiking Snow mobiling ATVing Vehicle driving Hiking Bicycling Dispersed camping Big game hunting Nature study Freshwater fishing Picnicking Cross-country skiing Small game hunting Waterfowl hunting Gathering forest products Spelunking	VCU 2200: 1 Anchorage 1 Dispersed Camp Site 1 Cave VCU 2221: 1 Trail
#31,156.01 10-Mile Estuary Semi-Primitive Modified (SPM) 230 total acres VCU 2221: 128 acres VCU 2210: 33 acres	Viewing scenery Viewing wildlife Boating Viewing from marine access Hiking Canoeing/kayaking Freshwater fishing Saltwater fishing Beachcombing Dispersed camping Picnicking Big game hunting	VCU 2221: 1 Dispersed Camp Site

Source: Nelson 1996

Continuing west into the 10-Mile Creek drainage, the landscape changes from rolling to an impressive steep, rock-walled valley rising 2,800 feet in two-thirds of a mile. A year-round waterfall (vertical drop of 30 feet) can be seen from the road. An alpine trail has been located and inventoried in the pass area of 10-Mile Creek. Excellent salmonberry and huckleberry crops were observed in the existing northern harvest units. The alpine areas extend halfway down the mountainside, adding texture and diversity to the viewshed. An interesting karst feature occurs six miles west of the pass: a grey, limestone-walled canyon measuring 20 feet across and 30 feet deep, with a gravel bottom. This ravine is spanned by the last bridge on the road system.

The 10-Mile Estuary Recreation Place (#31,156.01) is located 11 miles northwest of Tenakee Springs. There is a small, protected anchorage to the west of the Project Area that is used to access the dispersed camping sites in the area. A large beach area is associated with the estuary.

Road Management

The existing Road Management Objectives (RMOs) for the Project Area road system reflect a 1986 Road Order resulting from agreements made between the Forest Service and the City of Tenakee Springs. The Order closed the Indian River Road to vehicular traffic except for administrative use, commercial use by permit, or use by written authorization from the Sitka District Ranger. It was agreed that two gates would be installed, one at the first bridge on the Indian River Road and the other eight miles further north. This agreement has evolved unofficially to keeping the gates open, however, since the road system is not connected to any community and public vehicle use is rare.

Special Area Designations

The 1997 TLMP identified Special Interest Areas on the Tongass National Forest, and completed two required inventories: Roadless Areas and Wild and Scenic Rivers. No Special Interest Areas were identified within the Project Area.

Inventoried Roadless Areas were considered for possible Wilderness designation. Portions of two Roadless Areas are included in the proposed sale area: Tenakee Ridge (21,722 acres) and Game Creek (35,740 acres). Neither of these were recommended for Wilderness designation in the 1997 TLMP.

The Project Area has three major streams: Indian River, 10-Mile Creek, and Freshwater Creek. During revision of the Forest Plan, none of these streams were found eligible for inclusion in the National Wild and Scenic Rivers System (1997 TLMP, Appendix E).

Commercial Recreation Uses

The community of Tenakee Springs has been developing its tourist trade for years. Members focus on the remoteness of the community to provide a peaceful, wildlands experience. Their advertising emphasizes such recreation activities as soaking in the hot springs, walking, charter fishing, wildlife viewing, kayaking, mountain biking, and hunting. (See Table 3-27 for a summary of commercial recreation use and income.)

The Alaska Marine Highway schedules regular service to Tenakee Springs. Passengers view a portion of the Project Area (VCU 2200) as they travel to and from the community. During 1995, the State ferries made 362 passes by the Project Area while carrying a total of 28,040 passengers (Alaska Marine Highway 1996). Tenakee Springs had 1,321 passengers disembark and 1,209 passengers embark. The month of November had the highest number of passengers and vehicles (boats, ATVs) disembarking for deer hunting. In 1995, the Alaska Department of Fish and Game reported 244 deer taken from Wildlife Analysis Area (WAA) 3526 (the area surrounding Tenakee Springs). Juneau hunters harvested 77 percent of the deer taken from the WAA. (See the Subsistence and Wildlife Resource Reports for details.)

Three private fishing guides live in Tenakee Springs. Two of these were interviewed, and indicated that they serve 230 to 270 tourists each year, with 99 percent being from other states or nations (primarily from Europe and Japan). One guide family reported that they operate a fishing lodge four months of the year from Tenakee Springs; they ferry their clients to the fishing grounds each day. The other guide accommodates people on his boat for five months each year. Both use the Indian River bridge and falls for bear viewing and fishing about 13 percent of their time. They also use the saltwater immediately in front of the 10-Mile estuary for fishing. Their groups spend 153 to 192 days in the Inlet. (All day use numbers in this report are generated from groups/day and not people/day.)

The co-owners of the Tenakee Springs Mercantile, a complex which includes a grocery store, fuel dock and six cabins, had 880 people stay in their cabins in 1995 (Nelson 1996). This user group is from Juneau -- people taking a long weekend or deer hunting in the fall. They spent a total of 587 to 1,172 days in Tenakee Springs and the Inlet.

The Tenakee Springs harbor master reported 48 pleasure boats, averaging two people per boat, using the harbor in July and August in 1995 (Nelson 1996). A two-night stay was the average during these months, adding 96 days of group use to Tenakee Springs.

In Tenakee Inlet, viewing scenery is a popular recreation use. A number of groups view the Project Area from the small boat route (a Visual Priority Travel Route; see the Scenic Quality section). These groups may or may not physically use the Project Area, but they generate recreation/tourism income while in the Inlet. VCUs 2200, 2210, and 2221 are viewed by these groups. A small cruise ship business uses Tenakee Inlet on an inconsistent basis, four to eight times a year for half-day excursions to the Upper Tenakee Inlet estuary (Nelson 1996). This equates to an average of six group days of use, but encompasses 70 people per group. The focus of these tours is education/natural history.

People renting yachts to tour Southeast Alaska also use Tenakee Inlet. The boats usually carry 10-15 people, staying a day in the Inlet. From June to August, the Inlet averages two yachts a week, for 24 group days (Schaefer 1996).

In 1995, 13 outfitters and guides (O/G) held Forest Service permits to use the Tenakee Inlet area. The Chatham Area 1995 Use Report Summaries for Outfitter/Guides (Nelson 1996) reported:

- five guides (three big game, one fishing, one sightseeing);
- 13 trips (ten big game, two fishing, one sightseeing);
- an average of 47 nights of group use (44 big game, two fishing, one sightseeing);
- an average of 32 people; and
- an average outfitter and guide income of $82,900.

No Forest Service permitted outfitters and guides reported using the Indian River or 10-Mile Creek drainages, but their clients view portions of these drainages from saltwater.

Tenakee Springs and Tenakee Inlet are being used to generate recreation/tourism income. An economic recreation/tourism analysis was completed by the Forest Service Chatham Area Recreation Planner in September 1996. The results are displayed in the table below. This information was collected through telephone conversations with various private businesses, the Tenakee Springs harbor master, and Forest Service outfitter and guide records. All of these figures were taken from 1995 records (Nelson 1996).

Table 3-27
Commercial Recreation/Tourism Use and Income Summary

	In Tenakee Springs	Tenakee Inlet	Total
Average number of people willing to pay for recreation/ tourism experiences	1,226/yr.	752/yr.	1,978/yr.
Average days of use by groups generating recreation/tourism income	1,248/yr.	74/yr.	1,322/yr.
Average total recreation/ tourism income generated	$562,300/yr.	$176,950/yr.	$739,250/yr.

Source: Nelson 1996

Potential Recreation Opportunities

Within the Project Area, there are possibilities to increase recreation opportunities and uses. A list of enhancement opportunities and proposed projects is included in Chapter 2. These were identified from three sources: personal conversation with Tenakee Springs residents, the Sitka Ranger District's recreation public scoping (March 1994), and the Chatham Area recreation planner (Nelson 1996).

Scenic Quality

Because of public concern about the quality of the visual environment, the "visual landscape" has been established as a basic resource of the land, and receives consideration along with the other forest resources.

Adopted Visual Quality Objectives

The 1997 TLMP established visual resource management goals to be implemented in each land use designation (LUD) of the Indian River Project Area (see Table 3-28). These goals are referred to as adopted Visual Quality Objectives (VQOs), and are derived from a combination of two factors:

- whether the area can be seen from a Visual Priority Travel Route and Use Area (1997 TLMP, Appendix F*);* and
- the distance between the area being viewed and the viewer (also known as the "distance zones" -- foreground, middleground, and background).

Visual Priority Travel Routes and Use Areas. The 1997 TLMP identified priority viewpoints from which scenery will be emphasized. Viewpoints (either travel routes or use areas) are used to assess the existing visual condition of any given project area and to develop project designs that will be consistent with the adopted VQOs for each land use designation. The Alaska Marine Highway route and small boat route in Tenakee Inlet, and boat anchorages at Seal Cove and Long Bay (Tenakee Inlet) are Visual Priority Travel areas that are used to assess the existing visual condition of the Indian River Project.

Visual Quality Objectives. Visual Quality Objectives (VQOs) are described as five different degrees of acceptable landscape alteration:

Preservation (P) - Allows ecological changes only. Management activities, except for very low visual impact recreation facilities, are prohibited.

Retention (R) - Provides for management activities which are not visually evident. Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident.

Partial Retention (PR) - Provides for management activities to remain visually subordinate to the characteristic landscape. Activities may repeat form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape.

Modification (M) - Management activities may visually dominate the characteristic landscape. However, activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type.

Maximum Modification (MM) - Management activities of vegetative and land form alterations may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middleground, they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or contain detail which is incongruent with natural occurrences.

Table 3-28
Adopted Visual Quality Objectives, by Distance Zone and Land Use Designation (LUD)

Land Use Designation	Adopted VQO (as seen from a Visual Priority Travel Route and Use Area) Foreground	Middleground	Background	Not seen from Visual Priority Travel Route
Old Growth Habitat	Retention	Retention	Retention	Retention
Modified Landscape	Partial Retention	Modification	Modification	Maximum Modification
Timber Production	Modification	Maximum Modification	Maximum Modification	Maximum Modification

Source: 1997 TLMP

Summary of Current Visual Condition by VCU

The visual environment of the Indian River Project Area, as seen by an observer along the Tenakee Inlet Visual Priority Travel Routes, is summarized as follows:

VCU 2041 - Game Creek

Only a small portion of this VCU along the southern boundary is included in the Project Area; it is unseen from Tenakee Inlet. No timber has been harvested from this portion.

The 1997 TLMP designates the portion of VCU 2041 in the Project Area as a Timber Production LUD (see Figure 1-2, in Chapter 1). As shown in Table 3-28, the resultant adopted VQO for unseen areas in this LUD is Maximum Modification.

VCU 2160 - Freshwater Creek

This VCU is made up of the Freshwater Creek drainage system, and does not have any saltwater shoreline. It also is unseen from Tenakee Inlet. A total of 607 acres within the VCU has been previously harvested.

The 1997 TLMP designates 80 percent of this VCU as Timber Production, with an adopted VQO of Maximum Modification (see Figure 1-2 and Table 3-28). Twenty percent of the VCU is designated as Old Growth Habitat, with an adopted VQO of Retention.

VCU 2200 - Indian River

This VCU surrounds the town and much of the township of Tenakee Springs. Indian River, flowing to the north of Tenakee Springs into Tenakee Inlet, carves a narrow linear valley with densely covered slopes running to the northwest from the town. The shoreline includes the western end of Tenakee Township to near Columbia Point, approximately 5.5 miles to the east.

Much of the foreground is comprised of the town of Tenakee Springs. Directly behind the town rises a large mountainous ridge in excess of 3,500 feet, covered predominately by soft textured alpine with strong dark green fingers of spruce and hemlock projecting upwards. Small communities of trees add color and texture to the steep slopes. The structure of the ridge is complex, with the ridge folding and undulating around large bowls, chutes, and deeply cut V-notches. Avalanche and landslide chutes provide strong line and color contrast within the bowls, while blocky limestone outcrops and snow-covered peaks contribute further interest.

Several unique grasslands and marshes are located along the lower extent of Indian River. The surrounding slopes are steep and cut by numerous V-notches with blocky outcrops of limestone amidst a typical dense community of trees. Line, color, form and texture are strong but typical of Chichagof Island.

Much of the valley floor and ridges in the background in the western portion of this VCU are unseen, being masked by larger, steeper slopes in the middleground. A total of 848 acres within the VCU has been previously harvested; the harvested area is unseen from Tenakee Inlet.

The 1997 TLMP designates a portion of this VCU as Old Growth Habitat LUD, with an adopted VQO of Retention. The majority of the VCU is Timber Production LUD, with an adopted VQO of Maximum Modification (see Figure 1-2 and Table 3-28).

VCU 2210 - Whip Station

This VCU quickly rises from sea level to elevations in excess of 2,500 feet within 0.75 miles, therefore making the foreground the dominate distance zone. The entire VCU is blanketed by native spruce and hemlock vegetation to an altitude of 2,000 feet. The slope is scored by deep V-notches, with occasional blocky outcrops with resurgences and cascading water. Much of the VCU is composed of the common characteristics found on Chichagof Island.

A total of 460 acres within the VCU has been previously harvested. Four individual timber harvest units are evident along the coast; however, sufficient regeneration of alder and small communities of hemlock and spruce reduces the textural and color contrast of these units.

The 1997 TLMP designates most of this VCU (94 percent) as Old Growth Habitat LUD, with an adopted VQO of Retention. Five percent is Timber Production LUD, with an adopted VQO of Maximum Modification. One percent (near 10-Mile Creek) is Modified Landscape, with an adopted VQO of Partial Retention in the foreground (see Figure 1-2 and Table 3-28). Exceptions for small areas of non-conforming developments in Partial Retention areas (such as log transfer facilities) may be considered on a case-by-case basis.

VCU 2221 - 10-Mile

Only about one-half of this VCU is included within the Project Area. The foreground is comprised of gently sloped topography with a minimal shoreline devoid of bays, inlets, and shore energy. Toward the rear of the VCU, the slopes take on a more prominent slope with cascading streams, geological blocky outcrops, and deep drainage swales above 1,000 feet in elevation. The peaks are rounded and devoid of tree vegetation. However, there is a contrast between the alpine vegetation and rocky profile of the higher elevations. A great deal of this partial VCU has been harvested and is in varying stages of regeneration.

The coastal portion is visible in the middleground, from anchorages across Tenakee Inlet at Long Bay and Seal Cove. Both anchorages are Visual Priority Use Areas. The upper portion of the 10-Mile Creek valley (eastern section of the VCU) is unseen and makes up approximately 74 percent of the partial VCU.

The 1997 TLMP designates the eastern portion of this VCU as Old Growth Habitat LUD, with an adopted VQO of Retention. The northern portion is Timber Production LUD, with an adopted VQO of Maximum Modification (see Figure 1-2 and Table 3-28).

Heritage Resources

Heritage resources are the human element of the environment, and include archeological sites, historic sites, and traditional properties. Traditional properties are areas of cultural importance which may not have left material evidence of use, while historic and archeological sites have tangible elements.

Ethnographic records indicate that the Indian River Project Area is within the traditional territory of the Xutsnuwu Kwaan (Angoon) tribe. Historically, Angoon territory included eastern Chichagof Island, and much of eastern Baranof and western Admiralty Islands. Within this territory, Tenakee Inlet belonged to the Wooshkeetaan clan. However, it was formerly claimed by the Deisheetaan clan and the rights were transferred as settlement for a murder, according to Native law. See Appendix F maps.

Although the beginning of the Historic Period is generally given as 1741, European presence was slight until 1774. From 1774 to 1795, ships from Russia, Spain, England, France, and the United States visited Southeast Alaska. Their arrival initiated dramatic changes in regional subsistence and land use patterns. Disease and conflict reduced the Native population; Russian settlements and forts were built; and trade of sea otter for European goods became important.

During the twentieth century, a variety of commercial and government ventures were undertaken in Southeast Alaska. Most notable were fox farms, mines, World War II military installations, homesteads, timber harvest, commercial fishing, and Civilian Conservation Corps projects. Evidence of these last four activities has been documented in the Project Area.

Recognizing that heritage resources are non-renewable, the Chatham Area of the Tongass National Forest has a program of identification, evaluation, and protection. This program is undertaken in accordance with the National Historic Preservation Act (Section 106), the National Environmental Policy Act, and applicable implementing regulations. In order to accomplish this task effectively, the Alaska Region heritage resource staff developed a regional research design (Autrey 1993) to guide investigations. This design defines two geographical zones for the occurrence of heritage resources:

1) High probability. This zone extends from sea level to the 100 foot contour, and also includes areas based on the following criteria: previous investigations, presence of myth and legend sites, isostatic rebound, anadromous fish streams, and mineral zones.
2) Low probability. This zone includes land above 100 feet in elevation that does not meet the criteria for high probability.

Prior to the development of this research design, a heritage resource inventory had been conducted in the Project Area in 1975 (Myron and Bower 1996). While a variety of field methods were used, all concentrated on the shore of Tenakee Inlet. These investigations identified four heritage sites (49SIT048, 49SIT084, 49SIT167, and 49SIT181).

Recent investigations for the Project Area using the regional research design were primarily conducted in the high probability zone, and identified eighteen more historic and prehistoric sites. The original study area for this project was much larger than the Project Area as eventually defined. Therefore, a larger area was surveyed and many more sites identified than are actually within the final Project Area boundary. Radiocarbon analysis of 11 midden samples found in these investigations indicates that two sites are within the Middle Period. Seven samples date to the Late Period, and two are in the Historic Period.

Table 3-29
Summary of Heritage Sites in the Indian River Project Area

VCU	Site	Site Type	Eligibility
2201	49SIT468	+Trail	yes
2201	49SIT048	Petroglyph	#
2201	49SIT084	Community	#
2201	49SIT167	Burial	#
2201	49SIT181	Burial	#
2210	49SIT451	Machinery	no
2210	49SIT452	Machinery	no

Source: Myron and Bower 1995.
Non-Federal Lands; no determinations made
+ The trail lies on National Forest and non-National Forest land and extends beyond the Project Area boundaries.

Within the Project Area as finally defined, seven heritage sites were found. Table 3-29 lists these sites, as well as determination of eligibility to the National Register of Historic Places (NRHP). The determinations were made in consultation with Federal agencies, Indian Tribes, State of Alaska Historical Preservation Office, and other interested parties in the early stages of the planning process.

These sites are important cultural heritage elements. Combined with other heritage resources on the Tongass National Forest, they contain information important to the study of cultural patterns (origins, spatial and chronological distribution, subsistence, technology) and environmental conditions (glacial sequences, sea level fluctuations, vegetation succession, faunal history).

Land Status

The Project Area contains the following alienated lands, encumbrances, use restrictions, and partial interests.

State, Municipal, and Private Lands

State, municipal, and private lands are not owned by the United States. The following State, municipal, and private lands are located within the Project Area (from USFS Land Status Atlas, Sitka D-4 (SW) and (SE) BLM Master Title Plats, T. 47 S., R. 62 E.; T. 47 S., R. 63 E.; and T. 47 S., R. 64 E.; CRM, and State of Alaska patents):

1. State Selection AA-15077 (Tenakee Inlet) Tentative Approval of May 29, 1980, under authority of the Alaska Statehood Act of July 7, 1958 (P.L. 85-508), and Patent #50-82-0143.

2. Various eliminations (including townsite eliminations), under authority of the Act of June 4, 1897.

3. Various eliminations under authority of the Act of May 26, 1934.

4. Various patents under authority of the Act of June 11, 1906.

5. A July 28, 1930 elimination under authority of the Act of March 3, 1927.

6. State of Alaska Tidelands Patent No. 321, granted by the State to the City of Tenakee Springs on September 29, 1982 for Tracts A and B of ATS 1050 at Tenakee Inlet, within Sec. 23, T. 47 S., R. 63 E., CRM. Tract A is 23.586 acres; Tract B is 6.612 acres. Patent is subject, in part, to a covenant that the lands shall be used for public purposes only, and any other use will result in reversion to the State.

7. State of Alaska Patent No. 10649, granted by the State to the City of Tenakee Springs on August 11, 1989. Contains 204.83 acres within Secs. 21-23, T. 47 S., R. 3 E.; Secs. 17 and 20, T. 47 S., R. 64 E.; lot 4, USS 2450; and lot 10, USS 2451, CRM.

8. State of Alaska Patent No. 6728, granted by the State to the City of Tenakee Springs on September 29, 1982. Contains 2810.26 acres within Secs. 12 and 13, T. 47 S., R. 62 E.; Sec. 7, 16-18, and 20-24, T. 47 S., R. 63 E.; Secs. 17-20, T. 47 S., R. 64 E.; lots 7-9, USS 2451; lots 10-14, USS 2452; and lot 17, USS 2453, CRM. Patent is subject, in part, to the reservation of a 20-foot-wide perpetual public pedestrian easement along the existing Tenakee Trail.

9. State of Alaska Patent No. 6729, granted by the State to the City of Tenakee Springs on September 29, 1982. Contains 45 acres within Sec. 22, T. 47 S., R. 63 E., CRM. Patent is subject, in part, to the reservation of a 20-foot-wide perpetual public pedestrian easement along the existing Tenakee Trail. It is also subject to covenants that the City will continue to maintain the campground for public recreational purposes. Provisions are included for title to revert to the State upon the City's failure to do so.

State Selections

Section 6(a) of the Alaska Statehood Act of 1958 authorized the State of Alaska to select 400,000 acres of vacant and unappropriated land from within the National Forests of Alaska for furthering the development and expansion of Alaskan communities. The following lands within the Project Area have been selected by the State of Alaska under Statehood Act authority, but have not yet been conveyed by the Bureau of Land Management (BLM):

1. There is a 22.72 acre parcel (USS 6855) of NFS lands which is selected by the State under State Selection AA-15077, located in Secs. 21 and 22, T. 47 S., R. 63 E., CRM.

Withdrawals

Withdrawals close lands to further entry under the Federal lands laws, Federal mining laws, or both. These withdrawn lands are set aside for specific purposes stated in the instrument that created the withdrawal. Incompatible uses are precluded, in accordance with the withdrawal language. The following withdrawals are located within the Project Area:

1. A 0.50 acre Lighthouse Reserve, withdrawn indefinitely on February 13, 1921 by E.O. 3406, Item 78 (Grave Island), within Sec. 22, T. 47 S., R. 63 E., CRM (from USFS Land Status Atlas, 12/20/63, Sitka D-4 (SW) and BLM Master Title Plat, 11/17/93, T. 47 S., R. 63 E., CRM).

Rights-of-Way Acquired

These are rights-of-way acquired for public use and for Government administrative use of the Indian River Road #7500. Depending upon language within the applicable documents and type of grant, they may allow for construction, maintenance, use, reconstruction, or relocation of roads, trails, or other facilities. The authority to use, maintain, and improve the road is from the following sources:

1. United States v. City of Tenakee Springs Final Judgment (Civil Case No. A86-630, Quiet Title), decided October 9, 1990, in the U.S. District Court, District of Alaska, and recorded in the Sitka Recording District in Book 91, pages 359-361. Quiets title in a 66-foot road easement in the United States, said easement located in T. 47 S., R. 63 E., CRM (portion of Indian River road on City of Tenakee Springs property).

2. United States v. State of Alaska et al. Final Partial Judgment (Indian River Road, State Portion, Civil Case No. A86-630), decided August 7, 1987, in the U.S. District Court, District of Alaska, and recorded in the Sitka Recording District in Book 79, pages 798-803. Stipulation for Settlement which quiets a 66-foot easement in the United States for that portion of the Indian River Road located on State lands. Also includes an easement for a rock (gravel) borrow pit located in Sec. 15, T. 47 S., R. 63 E., CRM.

Transportation System

Roads

There are 23.2 miles of existing specified road in the Indian River Project Area. These roads were constructed as part of previous timber sale contracts for the purpose of timber haul and administration. Table 3-30 displays road miles for each VCU.

Table 3-30
Miles of Existing Road in the Project Area by VCU

VCU	Miles
2041	0.0
2160	7.5
2200	11.8
2210	0.0
2221	3.9
Total	23.2

Source: Costa 1996.

The existing road system begins at the site of the former Sunny Cove LTF, about two and a half miles east of the Alaska Marine Highway Dock at Tenakee Springs, Alaska. The LTF is accessed from the Project Area by means of the Indian River Road #7500, which travels along the Indian River drainage across National Forest, State, and City of Tenakee Springs lands. The Federal government holds rights-of-way for administrative use of the road across State and City lands.

Thirty-one log stringer bridges were surveyed on the road system in 1995, and none were found to be sturdy enough to permit log truck traffic (Mitchell 1995). After further review by fisheries specialists, it was determined that up to 24 of these bridges would need to be replaced on the existing road system. The other seven bridges could be replaced by culverts (Killinger 1996).

There is no road link between Tenakee Springs and the beginning of the Indian River Road. Instead, the road is accessed by the East Tenakee Trail (Forest Development Trail #553). The trail connects Tenakee Springs and the old cannery area located east of the city at Harley Creek, on the east shore of Tenakee Inlet.

Road Maintenance

The Chatham Area Transportation Management System (TMS) report lists maintenance levels for the existing roads in the Project Area as follows:

There are 20.4 miles of system road that are maintained at Maintenance Level 1. This level of maintenance allows for the road to vegetate naturally while drainage is maintained to keep the road bed from eroding. Drainage structures are either removed or kept open to allow cross drainage of the roadway.

There are 2.8 miles of system road in the Project Area that are maintained at Maintenance Level 2. This level of maintenance allows for high clearance vehicle traffic. Drainage is maintained.

No roads within the Project Area are maintained at Maintenance Level 3 or higher. These levels of maintenance would allow for passenger vehicle traffic.

Road Density

Table 3-31 displays road density by VCU. Road density is computed by dividing miles of road by square miles of land base in the VCU. The 23.2 miles of existing road are spread over 61.0 square miles in the Project Area. This equates to an average road density of 0.38 miles of system road per square mile of Project Area.

Table 3-31
Road Density

VCU	Existing Miles	Square Miles	Road Density
2041	0.0	1.2	0.00
2160	7.2	16.4	0.44
2200	12.5	27.7	0.45
2210	0.0	7.4	0.00
2221	3.5	8.3	0.42
Total	23.2	61.0	Average 0.38

Source: Costa 1996.

Logging Camps

There are no logging camps in the Project Area at this time.

Log Transfer Facilities and the Marine Environment

The marine environment for the Indian River Project is a 15-mile stretch of Tenakee Inlet, bordering the Project Area along the southern boundary of VCUs 2200, 2210, and 2220. Only nine miles of the shoreline is on National Forest land. The remainder is on State, City of Tenakee Springs, or private land.

One former and two proposed log transfer facility (LTF) sites have been identified in this project: Sunny Cove, Sunny Too, and 10-Mile Creek (see Figure 3-7). All sites were investigated and inventoried by marine biologists in 1995 and 1996, to determine the existing condition of plant and animal species. The dive inventories identified 6 species of plants and algae, 25 invertebrate species, and 9 fish species at the former and proposed sites (Costa 1996).

Sunny Cove LTF Site.

The former Sunny Cove LTF, located near the mouth of the Indian River, was built and used during previous logging activities in the Indian River, Freshwater, and 10-Mile drainages. Between 1977 and 1985, 57 mmbf of timber were transferred to saltwater at this LTF site. The site was last occupied in 1986. At that time, logs were placed directly into the water using an "A-frame" that was constructed on a log crib bulkhead. The log bundles were formed into rafts and moved either to Wrangell for processing into lumber, or to Sitka for pulp processing. The LTF is currently unusable. An engineering site survey of the existing facility would be needed to determine how much reconstruction or construction is needed to make it workable. The Forest Service has a Corps of Engineers (COE) permit for the bulkhead.

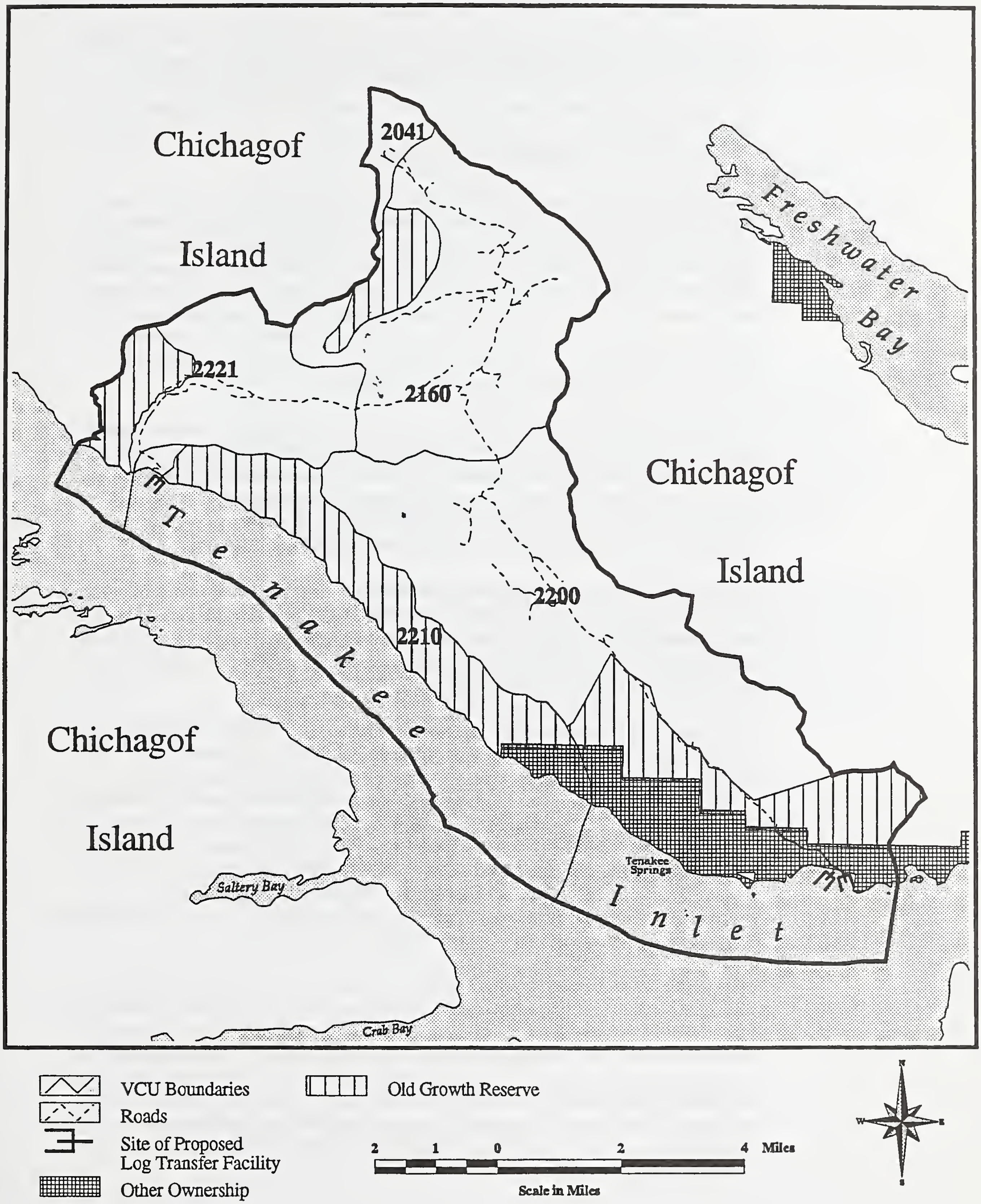
Previous studies indicate that bark can remain underwater at LTFs for long periods of time following LTF closure. During a 1996 investigative dive at the former Sunny Cove LTF, measurements were taken for bark deposition and depth (Boes 1996). The current zone of bark deposition is approximately 1.25 acres, with 0.04 acres having a bark depth of 10 centimeters and more (Costa 1996). This meets the Alaska Timber Task Force LTF guidelines (see Appendix K).

In 1982, the State of Alaska granted ownership of the tidelands on which the LTF is situated to the City of Tenakee. The Forest Service has an agreement with the City of Tenakee for reconstruction and use of this site, either as a drive down ramp or a bulkhead.

Marine and Air Transportation

The Alaska Marine Highway connects Tenakee Springs with the communities of Southeast Alaska; Prince Rupert, Canada; and Bellingham, Washington. Small commuter airline companies out of Juneau and Sitka, Alaska also serve Tenakee Springs.

Figure 3-7 Indian River Project Area and LTF Locations



Economics and Social Values

In Southeast Alaska, the population grew from 35,403 to 68,989 between 1960 and 1990 (an increase of 95 percent), with an average annual growth rate of 2.1 percent. The projected average annual growth rate for the 1990's is approximately 1.7 percent. At this rate, the population would increase to 81,756 by the year 2000. In 1960, the area's population accounted for 16 percent of the State population, while in 1990 this figure had dropped to 12 percent (Alaska Department of Labor 1992).

The lifestyles and social values of these Southeast Alaska residents are diverse. Some choose to live in the region because of the opportunity to participate in the commercial fishing, timber, mining, and recreation industries. Others desire the lifestyles afforded by remote, uncrowded living situations and the opportunity to be close to their families and friends. Still others choose to remain in Southeast Alaska because of the hunting, fishing, recreation and subsistence opportunities, and the chance to live in close proximity to a natural, unmanaged environment. Many Native Alaskan residents remain attached to Southeast Alaska because it provides an important link in the practice of traditional customs and in the preservation of their cultural heritage.

Such great diversity in attitudes, beliefs, values, and lifestyles suggests that the proposed Indian River project would have both positive and negative effects on the people of the region. Many Southeast Alaskans want to keep that which makes their part of the world unique. At the same time, they also want to maintain their economic livelihood (USDA Forest Service 1990). In reality, the resource base is limited, which makes it increasingly difficult to resolve conflicts between quality of life and economic security.

A high percentage of Southeast Alaska residents derive their livelihood from jobs or other activities which in one way or another are tied to the Tongass National Forest. Most also participate in a wide variety of personal activities which depend upon the forest. Resource management actions in the forest (such as are proposed in the Indian River project) have the potential to impact every community in the region.

For example, the economic and social life of Hoonah and Ketchikan is tied to logging and related industries; these towns would be affected by changes in the National Forest timber supply. Angoon, Hoonah, and Tenakee Springs rely on commercial fishing as their primary economic support, and could be affected by changes in the quantity and quality of fish and fish habitat. The economic foundations of Tenakee Springs (and to a lesser extent, Sitka, Gustavus, and Juneau) depend on recreation and tourism; changes in the pattern of recreational opportunities and visual qualities of the forest would have an economic affect. Angoon, Hoonah, and Tenakee Springs also benefit from nearby subsistence opportunities, and could be affected by changes in the availability of large and small game, fish, berries, and firewood.

In summary, all of the various resources in the Tongass National Forest are central to maintaining stability of life and overall social health of the region. Careful management is vital. As discussed above, however, community stability is quite difficult to quantify in Southeast Alaska, due to the many variables which may influence it. Employment levels, incomes, receipts, multipliers, etc., do not give the entire picture, particularly with respect to quality of life aspects. Nevertheless, a balance created by having a variety of natural and human-related resource activities is key. Such equilibrium is significant as it prevents exploitation of any one resource, and ensures the availability of these resources for all the communities in the region, now and in the future.

Regional Perspective

The primary area of influence for the Indian River Project, with respect to the economic environment, is Southeast Alaska. This geographic region extends roughly 500 miles from Ketchikan in the southeast to Yakutat in the northwest, and is mainly unpopulated wild country. Nearly 80 percent of the region is located within the Tongass National Forest, the largest forest in the National Forest System. The region's population of 69,000 people is divided among 33 cities, towns, and villages located within, or very near, the Forest boundaries.

Settlements in Southeast Alaska range in size from one person living near a sheltered bay to more than 28,000 people living in a full-service community. Although some communities are on Forest road systems, most settlements are accessed primarily, if not exclusively, by aircraft or boat. This relative degree of remoteness, combined with the considerable scenic and recreation opportunities provided by the Tongass National Forest, is sought by many wanting a more self-reliant lifestyle. Residents are often quick to point out that the quality of life found in Southeast Alaska outweighs the possible disadvantages of seasonal employment, lack of jobs, cost of importing goods and services, transportation, and weather.

Most communities in the region are characterized by a dependence on one or more natural resource-based industries including: wood products, commercial fishing and fish processing, tourism and commercial recreation, mining, and mineral development. Government, especially in Juneau, transportation and educational services are also significant income sources. Residents of the numerous small, rural communities also depend heavily on subsistence fishing and hunting to meet their basic needs. The following sections provide an overview of the regional economy and the three communities in close proximity to the Project Area. (See Table 3-32.)

A mix of employment growth and decline is projected for Southeast Alaska in the near term. Gains are expected in the mining industry following the reopening of the Greens Creek Mine on Admiralty Island. Construction employment is expected to increase in response to a number of residential and public works projects. As visitation to Southeast Alaska continues to increase, so too does employment in the services and retail trade sectors of the economy. The commercial fishing industry is expected to continue to play a large role in the economic picture. (See Tables 3-32 and 3-33.)

The gains in these industries are expected to be tempered, however, by some declines. Reduced logging activity is expected and will result in fewer jobs. The outlook for the government sector is also bleak as budget concerns are expected to lead to job cuts. In the fishing industry, a newly implemented "individual quota shares" (IFQs) system for some commercial species is expected to reduce the number of seasonal and short-term processing and fishing crew positions.

Additional economic information may be found in other sections in this chapter.

Table 3-32
Southeast Alaska Wage and Salary Employment
1995 and 1996 Forecast

	Annual Average Employment 1995	Forecasted Annual Average Employment 1996	Forecasted Change from 1995 to 1996
Goods Producing			
Mining	200	350	150
Construction	1,600	1,700	100
Manufacturing	3,950	3,775	-175
Seafood Processing	1,600	1,550	-50
Forest Products *	2.050	1,925	-125
Subtotal	5,750	5,825	75
Service Producing			
Transportation	2,950	3,000	50
Trade	6,700	6,900	200
Wholesale	550	550	0
Retail	6,150	6,350	200
Finance, Insurance, and Real Estate	1,400	1,425	25
Services and Misc.	6,600	6,850	250
Government	12,350	12,2752	-75
Federal	1,950	1,900	-50
State	5,400	5,325	-75
Local	5,050	5,050	0
Subtotal	29,950	30,450	500
Total	35,700	36,275	575

Source: Alaska Department of Labor 1996.
* Includes pulp mills and lumber and wood products.

Table 3-33
Tenakee Inlet and Freshwater Bay Fisheries

Salmon*	Average Number per Year (1985-1995)
Chinook	91
Chinook Jack	218
Coho	1,946
Sockeye	2,768
Pink	602,207
Chum	102,360
Groundfish	Average Pounds per Year (1987-1995)
Demersal Shelf Rockfish	596
Pacific Cod	2,908
Other Rockfish	100
Invertebrates	Average Pounds per Year (1985-1995)
Dungeness Crab	64,532
Tanner Crab	41,954
Brown King Crab	1,733
Blue/Red King Crab	**8,689
Shrimp	12,792
Sea Cucumbers	***31,995

Source: Alaska Department of Fish & Game 1995
* Because trollers do not report by sub-district, data for salmon caught in the troll fishery in Tenakee Inlet/Freshwater Bay are not available and therefore not included in this table.
** 1993 through 1995
***1989 only

Community Profiles

Following is information about nearby communities most likely to be affected by the action alternatives. Most of this information is from the 1997 TLMP EIS (USDA Forest Service 1997a). Comments displayed here were part of a non-random, self-selecting sample; therefore they may not necessarily reflect community opinion.

There are three communities near the Indian River Project Area. Angoon is approximately 22 miles to the southeast; Hoonah is about 22 miles to the north; and Tenakee Springs is within the project boundaries. Residents of Hoonah and Tenakee Springs are likely to visit the area for hunting, fishing, subsistence, or recreational purposes. Angoon residents are less likely to visit. Bear hunting guides from other Southeast Alaska communities have permits to use the Project Area during hunting season. Timber sales from within the Project Area would be available as part of the independent sale program; a number of communities in the region have logging firms that could be employed in this timber harvest activity. Several communities also have wood processing facilities that would likely utilize this timber.

Angoon

Angoon has a population of approximately 600. Employment is highly seasonal in all sectors of the town's economy, and the unemployment rate persists at around 10.6 percent throughout the year. The 1990 median household income was $32,083 (USDA Forest Service 1997a). Problems with unemployment are compounded by the high cost of living in a remote area. Many residents are commercial hand trollers; commercial fishing is a major source of revenue to the community. The Chatham School District is also a primary employer. Logging camps in the vicinity occasionally provide additional employment opportunities. Subsistence hunting and fishing are vital food sources, as well as an important part of the residents' lifestyle and culture.

During the TLMP Revision process, people in Angoon expressed a desire to see more emphasis placed on scenic resources, recreation, fish, wildlife, and subsistence. While some communities in the area of the Tongass have expressed the need to reduce logging to maintain tourism and commercial fishing, the people in Angoon simply want to maintain their traditional and healthy food supply. They do not want additional roads and log transfer facilities, nor do they want to be connected to other roads. They emphasized the importance of subsistence to the community and pointed out the detrimental changes to their traditions since Caucasians came to the area 250 years ago. They are concerned with the high unemployment rate of Angoon, and stress the need for subsistence resources in this regard.

Hoonah

Hoonah has a population of 903. Fishing and fish processing, timber, and the retail trade are the primary sectors of the economy, with all sectors being highly seasonal. Hoonah has a median household income of $36,442 and an unemployment rate of 10.6 percent throughout the year (USDA Forest Service 1997a).

People in Hoonah indicated that their opinions are split regarding the harvest of timber along Alaska Marine Highway routes, roads, streams, and around their community. Half of them want more emphasis on recreation, and half are satisfied with the current mix of emphasis. They want additional emphasis placed on fish and on old-growth habitat near the town. The Hoonah City Council requested additional emphasis on subsistence resources. Other individuals want the current timber sale program to continue, and believe the Forest Service has an obligation to maintain local and regional economics. Still others said they want the current amount of logging reduced. They want more provisions for short-term or small business sales, stating that these are better for the future of the industry.

Some favor additional roads and log transfer facilities, and encourage connecting existing roads. They want the tourism, recreation, and fishing economic sectors emphasized. (Note: The Tongass Timber Reform Act prohibits Department of Agriculture construction of any access road between Hoonah and Tenakee Springs or any other logging road system on Chichagof Island, unless the city councils of the two communities decide the roads should be built.)

Huna Tribal Council and other Native Alaskans are concerned with the effects of additional logging on wildlife and subsistence uses, and on traditional use areas.

Tenakee Springs

Tenakee Springs has a population of 111 residents. It is a popular "get away" area and favorite stop for boaters. A number of Juneau residents maintain second homes there. The 1990 median household income was $18,125. Unemployment in 1994 for this census area was 10.6 percent, compared to 8.2 percent throughout Southeast Alaska (USDA Forest Service 1997a). The major employers are a highly seasonal fisheries and retail trade, and local government (USDA Forest Service 1997a).

Proposals for logging in areas close to Tenakee Springs have raised local interest, sentiment, and debate about what mix of values the forest should provide. Some people support a sustainable timber industry to diversify the economics of the local communities. At the same time, there is considerable opposition to clearcut logging in an area considered to be in Tenakee Springs "backyard." Most, if not all, of the Project Area appears to lie within that area of concern. At the heart of the debate is a sincere and strong desire on the part of most people in the town to maintain their current lifestyle.

Tenakee Springs residents and the City of Tenakee Springs want to see more emphasis placed on scenic resources, recreation, fish, wildlife, and subsistence. They want the current timber sale program reduced. They do not feel that jobs should be the reason for making forest use decisions. Neither residents nor the City want additional roads, log transfer facilities, or connection to existing roads. They feel that more roads mean more hunter access and fewer deer. They are opposed to emphasis on mining exploration and development, and favor additional Wilderness designation. They want the Forest Service to emphasize tourism, wildlife, recreation, and subsistence sectors of the economy. Both the City and Tenakee Springs Fish and Game Advisory Committee are concerned with the current and projected future declines in wildlife habitat capability in the area, especially along Tenakee Inlet.

Timber Receipts and Payments

In accordance with Federal law, 25 percent of the money collected from the use and sale of National Forest products and services is returned to the state from which those revenues originate. Sources include receipts from timber sales, purchaser road credits, mining, recreation fees, and special use permit fees.

In 1996, total Tongass and Chugach National Forests receipts were $23,622,080. Based on this figure, payments to the State in fiscal year (FY) 1997 were $5,905,520.

These 25 percent funds are dedicated to public schools and roads. Disbursement is controlled by each state according to its own laws and regulation. In most states, the money is returned to counties in proportion to the receipts generated within each county. In Alaska, funds are distributed instead to organized boroughs based on National Forest acreage within each borough. The organized boroughs in the Chatham Area received the following amounts in FY 1997: Haines, $321,716; Juneau, $601,953; Sitka, $634,274; and Yakutat, $430,778.

Money is also distributed to cities and schools located within National Forests, but outside of organized boroughs; distribution is based on miles of road each city maintains and student enrollment in each school system or Regional Education Attendance Area (REAA). Because of Alaska's disbursal method, the amount of money a community receives does not depend directly upon the timber or other receipts generated in its borough. See Table 3-34 for FY 1997 National Forest payments to unorganized boroughs in the Project Area vicinity.

Table 3-34
FY 1997 National Forest Payments to Communities Near the Project

Community	Road Miles	Road Mile $	Number of Students	School $	Total Payment
Hoonah	8.00	$19,352	271	$195,073	$214,425
Angoon	7.70	$18,626	146	$105,095	$123,721
Tenakee Springs	2.50	$6,048	16	$11,517	$17,565

Sources: Alaska Dept. of Community and Regional Affairs 1997, and Alaska Dept. of Education 1997.
* Schools in Tenakee Springs and Angoon receive funding through the Chatham REAA. National Forest payments are distributed to eligible city school systems and REAAs at the same $/student rate, approximately $919.83 per student in 1997.

Chapter 4
Environmental Consequences

Chapter 4

Environmental Consequences

Overview

This chapter describes the environmental consequences of the six alternatives presented in Chapter 2. Environmental consequences are the effects an alternative would have on the physical, biological, social, and economic environment. These effects may have consequences that are both beneficial and detrimental. Effects are quantified where possible, although qualitative discussions are often necessary. All significant or potentially significant environmental consequences are disclosed here, including the direct, indirect, and cumulative effects on the resources discussed in Chapter 3.

Direct Effects

Direct effects happen at the same time and place as the initial cause or action.

Indirect effects occur later, or are spatially removed from the activity.

Cumulative effects are the effects of actions when added to other past, present, and reasonably foreseeable future actions.

Direct effects are defined as those occurring at the same time and place as the initial cause or action. For this project, the time period during which direct effects are expected to occur in the Project Area is from the expected initiation of harvest activities (late 1998) to the expected completion of those activities (year 2003).

Indirect Effects

Indirect effects are those that occur later in time or are spatially removed from the activity but would be considered significant in the "reasonably foreseeable future." The reasonably foreseeable future for most resource effects analyses in the Indian River Project is assumed to extend from the implementation of the project to the year 2010. The year 2010 is the estimated completion date for all planned timber sales identified in the Chatham Area Timber Sale Planning Schedule (March 1997). The current schedule provides the most accurate locations and time frames for projects that may have an influence on the Project Area.

Cumulative Effects

Cumulative effects are the results of collective past, present and reasonably foreseeable future actions. They can result from individually minor but collectively significant actions taking place over a period of time. An analysis of these effects considers the environmental effects of projects that overlap in both time and space, and that have an influence on the Project Area.

Cumulative effects analyzed for the Indian River Project include the effects of the large scale logging that has taken place since 1956 when the Forest Service entered into a 50-year contract with the Alaska Pulp Corporation (APC). The analysis also considers actions undertaken or planned as a result of planning schedules or the recent Records of Decision (RODs) for the Kennel/Whitestone and Eight Fathom timber sale projects. Harvest activities on non-National Forest lands are also considered.

For most resources evaluated in this project, the area in which cumulative effects are expected to occur is Northeast Chichagof Island. However, the analyses of certain resources required considering a different geographical area of influence. For example, Tenakee Inlet was the area used in analyzing the direct, indirect, and cumulative effects of the alternatives on the recreation and scenic quality resources.

Longer time frames than the reasonably foreseeable future (defined as year 2010) were also needed to evaluate the cumulative and indirect effects of the alternatives on the wildlife and subsistence resources in the Project Area. For these resources, analysts used the period from 1998 through 2050 to study closed canopy effects on habitat. Information from the 1997 TLMP FORPLAN (see Glossary) was used to project timber harvest beyond the year 2010.

Assumptions: Reasonably Foreseeable Effects

The following assumptions were made to assess reasonably foreseeable effects. These assumptions reflect current management/technology of National Forests and provide a uniform approach to estimating effects of timber harvest and road construction.

- Laws, standards and guidelines, and Best Management Practices (BMPs) for resource protection would be followed. These requirements are expected to be at least as stringent in the future as they are today.
- Timber sale planning would occur in an interdisciplinary fashion.
- Timber harvest can occur anywhere on suitable productive forest land.
- The No-Action Alternative would represent only a delay in implementing the 1997 TLMP and, based on volume projections, this Project Area would be revisited in approximately 10 years.
- Future effects on resources from timber harvest and road construction would be similar to impacts projected for current alternatives.

Other Environmental Considerations

Chapter 4 concludes with other environmental considerations that must be addressed under the National Environmental Policy Act (NEPA) but do not fall under the categories discussed in Chapter 3. These topics include:

- unavoidable adverse environmental effects;
- the relationship between short-term uses and the maintenance and enhancement of long-term productivity;
- the irreversible and irretrievable commitments of resources;
- possible conflicts between the proposed action and the plans of other jurisdictions; and
- other environmental considerations.

Many adverse effects would be reduced or mitigated by limiting the extent or duration of effects. Specified mitigation measures for project activities would be implemented in the alternatives within standards and guidelines. Mitigation measures are discussed in this chapter, in Appendix C, and in the road and unit cards (Appendices I and J).

Geology, Minerals, and Caves

Direct, Indirect, and Cumulative Effects

Mining and Minerals

Implementation of any one of the action alternatives would have limited or no direct or indirect effect on the minerals and geology resources within the Project Area. There would be no effect to the locatable and leasable mineral resources because there are no known or suspected deposits on National Forest land in the Project Area.

Less than ten miles of new road would be constructed and less than 25 miles of existing road would be reconstructed in any alternative. A relatively small quantity of fill and shot rock (salable minerals) would be extracted from existing or new rock quarries for this work, and for the development of log transfer facilities (LTFs). Existing rock quarries are displayed on the Alternative maps. Potential rock quarry sites were observed during field reconnaissance. The estimated volume of rock required for development is summarized by alternative in Table 4-1.

The direct, indirect, and cumulative effects of developing rock quarries include potential water quality impacts and the irreversible loss of less than five acres of wildlife habitat. Best Management Practices (BMPs) have been designed to reduce potential short-term water turbidity and minor increases in sedimentation rates (BMP 14.18) to acceptable levels. The loss of less than five acres of wildlife habitat is not expected to result in the listing of any species, nor is it expected to cause loss of species viability.

Table 4-1
Summary of Estimated Rock Needs by Alternative

Alternative	Estimated Rock Volume (cubic yards)
A	0
B	103,000
C	120,000
D	110,000
E	111,000
F	135,000

Source: Costa 1997

Effects on Cave Resources

Caves

The purpose of the Federal Cave Resources Protection Act of 1988 (FCRPA) is to secure, protect, and preserve significant caves on Federal lands for the perpetual use, enjoyment, and benefit of all people. There is one known potentially significant cave in the Indian River Project Area. If the Forest Supervisor determines that this cave is significant (as defined in the FCRPA and 36 CFR 290), the cave would be protected and its specific location would be kept confidential.

A timber harvest unit included in all of the action alternatives is located within a quarter mile of this cave. There is no evidence to indicate that surface or sub-surface water flowing from this unit contributes to the development of the cave. Dye tracings indicated that water flowing underground that could contribute to development of this cave occurs at higher elevations than the harvest unit. In addition, the unit would be helicopter yarded in all alternatives, reducing the possibility of soil disturbance that could impact water quality and other agents of cave formation.

Karst Resources

Direct, indirect, and cumulative effects on karst resources resulting from management activities include water quality impacts, such as sedimentation and re-routing the flow of water away from the karst system. On karst lands, fissures on the surface of the ground become injection points into a more complex subsurface drainage system. These fissures rapidly move water and sediment delivered from surface sources vertically downward into underground lateral systems. Sediment and water transported from roads and disturbed lands such as harvest units may emerge unexpectedly at one or more distant springs, even across surface watershed boundaries (TLMP, USDA Forest Service 1997).

Specific karst management objectives are provided in the 1997 TLMP to protect karst resources and minimize impacts from planned activities such as timber harvest. These objectives are grouped by karst vulnerability classification (low, moderate, and high), with increasingly stringent measures applied to moderate and high vulnerability karstlands. Potential impacts from the timber management proposed in the action alternatives would be avoided by following the karst management objectives, as well as BMPs designed to maintain water quality and free flow of water.

All of the action alternatives include timber management activities on areas assessed by geology consultant, Harza Northwest, Inc., as having low, moderate, and high karst vulnerability. The majority of these activities, however, would not occur on or near karst.

The unit cards in Appendix J include instructions to notify the Forest Geologist if karst features (e.g., caves, springs, and disappearing streams) are located during unit layout and harvest. Additional analysis would then be done to further determine levels of karst vulnerability and appropriate protection measures.

Cumulative Effects

Timber management activities are currently planned in the Eight Fathom Timber Sale(s) Project to the west of the Project Area. Additional timber management activities are scheduled to be planned in Management Area C30 (Kennel/Whitestone Timber Sale Project) to the north. Because road and facility construction are planned or would be planned as part of these projects, there would be additional demands for common variety mineral resources and impacts associated with opening rock quarries.

A fish ladder is planned to be constructed in Indian River, and is not expected to have any direct, indirect, or cumulative impacts on mineral, geology, and cave resources. Interest has been shown in developing an open pit limestone quarry in the Kennel Creek drainage. If this proposal is implemented, additional environmental analysis (including cumulative impacts) would be conducted.

No known cave resources have been directly affected by past timber harvest and road construction in the Project Area. Adherence to BMPs and standards and guidelines in implementing future activities would prevent effects to cave resources. Consequently, long-term cumulative effects to cave resources are expected to be minimal.

Soils, Water, and Fish

Direct, Indirect, and Cumulative Effects

This section describes the projected direct, indirect, and cumulative effects of the proposed Indian River Timber Sale(s) on the combined resources of soil, water, and fish, as well as riparian areas and wetlands in the Project Area. Further discussion of effects on riparian areas and wetlands is included in the Vegetation section in this chapter. Specific measures to protect soil, water, and fisheries resources are described in the road and unit cards (See Appendices I and J).

Soils and Water Quality

Impacts to water quality from the action alternatives would be in the measurable form of increased levels of sedimentation, changes in chemical water quality, stream water temperatures, and stream flows.

The State of Alaska has determined that the reasonable implementation, application, and monitoring of Best Management Practices (BMPs) can effectively maintain water quality. BMPs minimize the risk of accelerated sedimentation by avoiding or protecting the areas of highest risk and concern. In planning the roads and harvest units for this project, GIS data base information and field-gathered data was used to identify and avoid or protect these areas. (See the road and unit cards in Appendices I and J for specific applications of BMPs and other mitigation measures.)

The highest risk areas have been avoided by:

- Eliminating areas rated as extreme mass movement hazard from consideration for harvest or road construction.
- Deleting units or roads after field review indicated that they were located in areas that should be rated as extreme mass movement hazard soils.
- Adjusting unit boundaries or road locations to avoid small areas or inclusions of extreme mass movement hazard soils.
- Eliminating roads in these areas by selecting helicopter harvest systems.

Areas of high concern within the Project Area are further protected by prescribing the following practices:

- Selecting harvest prescriptions, such as group selection or overstory removal, that leave many trees in the unit to help maintain soil stability.
- Selecting harvest systems, such as helicopter or full or partial suspension cable systems, which minimize ground disturbance.
- Using road construction techniques, such as partial or full bench construction, which minimize the effects on slope stability.
- Designing and installing road drainage structures which minimize sedimentation.
- Designing and sizing stream buffers which minimize the risk of windthrow and slope failure.

Comparison of Sedimentation Risk by Alternative

A sediment risk analysis model developed by Geier and Loggy (1995) was used to predict for each alternative the relative increase in sediment likely to be produced and transported to streams. The model takes into consideration both natural conditions (stream density, sub-basin area, and soil characteristics) and management activities (harvest acres, logging systems, road miles, and stream crossings per mile of road).

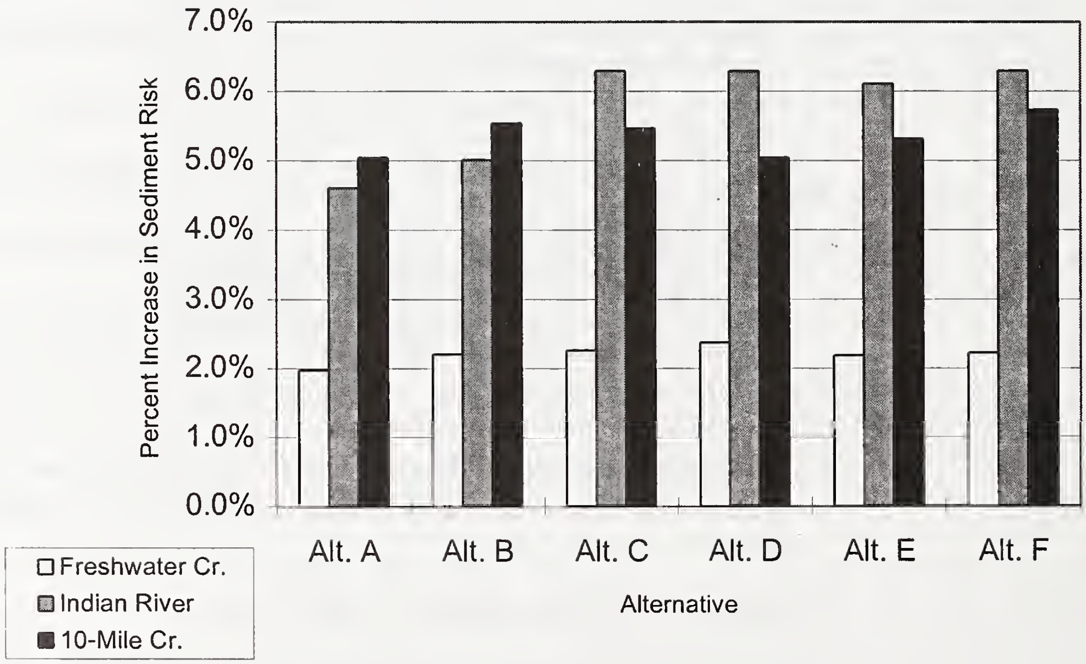
In order to evaluate the significance of the changes in sediment risk for each alternative, the following factors were considered:

- the projected change in sediment risk over existing conditions;
- the cumulative change, which includes the impact of previous and projected harvest and road construction;
- the location of the sub-basin or reach in relation to "response reaches" (see Glossary);
- the level of the existing sediment risk value. (For example, is it currently high or is it projected to change to high?)

Figure 4-1 shows the sediment risk for each watershed, by alternative. (Note: "Pre-harvest conditions" in Figure 4-1 refers to conditions before 1956, when large-scale commercial timber harvest began in the Project Area.) The change summed for each watershed is no more than 1.6 percent in any action alternative when compared to current conditions (Alternative A). This low increase in sediment risk is not enough to be a significant concern. According to these results, all alternatives satisfactorily minimize the risk of sediment delivery to streams (Killinger et al. 1996).

The projected cumulative increases are also relatively low. Nearly all the change comes from past activities. As shown in Figure 4-1, the cumulative changes for each whole watershed are 6.3 percent or less for all alternatives, when compared to pre-harvest conditions (year 1956). These percentages are low enough in all alternatives that they are not a significant concern.

Figure 4-1 Increase in Sediment Risk over Pre-harvest (Year 1956) Conditions by Alternative and Watershed



While the sediment risk analysis model described above is accurate down to the scale of sub-basins, it may not adequately predict potential risk on individual sites. The most notable concern of this sort occurs along proposed Forest Service Road #7502, which would provide access to the LTF at the mouth of the 10-Mile Creek watershed in Alternatives B and D. A 200-yard segment of this road crosses sideslopes of over 100 percent, posing a high risk of mass failure. The slope below the road continues downward to 10-Mile Creek. Consequently, if a slide did occur, it would go directly into the stream. The application of BMPs and prudent road construction techniques (for example, earth-retaining structures below and adjacent to the road) may alleviate the concern.

Water Chemistry

Chemical water quality in the Project Area is similar to pristine conditions. No changes in chemical water quality from samples taken before and after previous timber harvest were evident (Paustian et al. 1996). Although no additional water chemistry data has been analyzed, there are no indications of historic or future sources of chemical contamination. Atmospheric sources of chemical pollutants are not a major factor influencing water quality in the region. Therefore, it is unlikely that minor soil disturbance from logging activities would result in measurable changes in dissolved water quality constituents (Paustian et al. 1996).

Additional road construction could change surface and shallow ground water drainage patterns in fen wetlands and potentially result in depressed pH values in some palustrine channels (see Glossary). However, additional road construction in fens would be minor under any of the alternatives, and is not expected to have any major impact in any of the alternatives.

Stream Temperature

Because Riparian Management Areas (RMAs) have been incorporated into the Indian River Project design, no stream temperature changes are anticipated from any alternative. Streams adjacent to proposed harvest units would have a riparian buffer, and temperature effects would be negligible. (See the Fish and Vegetation sections in this chapter and in Chapter 3 for further discussion of Riparian Management Areas.)

Stream Flow

In large basins where timber harvest activities are dispersed in space and over time, small changes in streamflow can be expected (Paustian et al. 1996). Streamflow analysis for Staney Creek, a large watershed on Prince of Wales Island, indicated that summer low flow volumes increased only after 35 percent of the watershed was harvested. As shown in Tables 4-2, 4-3, and 4-4, no alternative proposes harvest approaching this level in any watershed.

Rain-on-snow peak flow events have the greatest susceptibility to change as a result of timber harvest in Southeast Alaska. A flow analysis indicates that, of the three major watersheds in the Project Area, Indian River has the greatest susceptibility to rain-on-snow events due to the relatively large transient snowpack area in the drainage. However, rain-on-snow events are infrequent in the area, and major peak flows observed over the past two decades have been associated with fall rainfall events.

From assessing harvest levels in the transient snow zone (i.e., area of winter snow pack) and cumulative basin-wide harvest by alternative, it is anticipated that some increase in summer low flows and peak flows would occur. These increases should not be significant enough, however, to affect channel morphology and habitat condition. The harvest level increases under all alternatives are not sufficient to produce significant flow changes in the Indian River system. (See Table 4-2.)

Table 4-2
Indian River Drainage (VCU 2200) Harvest Level by Percent of Transient Snow Zone (TSZ) and for Entire Watershed

Alt.	% Proposed Harvest in TSZ	% Cumulative Harvest in TSZ	% Proposed Harvest in VCU	% Cumulative Harvest in VCU
A	0	9	0	6
B	7	16	5	11
C	4	13	3	9
D	1	10	0	6
E	5	14	3	9
F	10	19	6	12

Source: Kelliher 1996

In the Freshwater Creek drainage, some increase in peak and summer low flows is anticipated from the planned harvest levels. However, the increase to flows should not be significant enough to affect the stream morphology, substrate or large woody debris and therefore the Class I stream habitat condition. (See Table 4-3.)

Table 4-3
Freshwater Creek Drainage (VCU 2160) Harvest Level by Percent of Transient Snow Zone (TSZ) and for Entire Watershed

Alt.	% Proposed Harvest in TSZ	% Cumulative Harvest in TSZ	% Proposed Harvest in VCU	% Cumulative Harvest in VCU
A	0	13	0	6
B	9	22	7	13
C	11	24	9	15
D	11	24	9	15
E	10	23	8	14
F	11	24	9	15

Source: Kelliher 1996

Table 4-4
10-Mile Creek Drainage (VCU 2221) Harvest Level by Percent of Transient Snow Zone (TSZ) and for Entire Watershed

Alt.	% Proposed Harvest in TSZ	% Cumulative Harvest in TSZ	% Proposed Harvest in VCU	% Cumulative Harvest in VCU
A	0	25	0	7
B	26	51	13	20
C	26	51	13	20
D	30	55	14	21
E	17	43	8	15
F	32	57	14	21

Source: Kelliher 1996

In the 10-Mile Creek drainage, harvest levels in the transient snow zone will double under Alternatives B, C, D, and F. A small to moderate increase in peak and summer low flows is anticipated, but should not increase the stream power and its bed scour capacity significantly. (See Table 4-4.)

Fish and Fish Habitat

Propagation of fish is a primary beneficial use of water in the Project Area. Logically, potential risks to water quality resulting from timber harvest activities are also risks to fish and fish habitat. These include increased sedimentation, cumulative changes in water temperature, and reduced summer or winter low flows in streams (and consequent impaired summer rearing and spawning for salmonids). Destabilization of stream banks caused by blowdown, and impairment of fish passage from improper drainage structure installation are also potential impacts (Killinger et al. 1996).

Protective measures already discussed in this chapter pertaining to water quality, water temperature, and stream flow are also applicable to the protection of fish and fish habitat. Risks to fish resulting from the proposed Indian River Timber sales would be minimized by a similar two-part process: 1) avoiding the areas of highest risk and 2) protecting the other areas of concern. Best Management practices are involved in both steps.

Fish biologists and hydrologists visited streams in the Project Area during the 1994 and 1995 field seasons to confirm and collect existing stream information, and to document and classify unmapped streams near potential impact areas. These field inventories and the GIS data base were then used to identify and analyze areas of high risk to fisheries in the Project Area, such as wetlands, streams, and associated riparian areas. From this analysis, the initial pool of potential harvest units and roads was modified to avoid those areas that conflicted with stream riparian buffers or were obvious areas of high risk to aquatic resources.

Avoiding areas of high concern and using protection measures (e.g., Best Management Practices and the guidance detailed in unit and road cards) should assure protection of riparian areas and aquatic habitat. With the protection provided by these measures, the primary impacts to fish habitat and water quality would be from:

- unplanned events such as landslides, or large-scale blowdown;
- roading through wetlands, streams, or riparian areas;
- sediment from roads;
- short-term changes in the magnitude and frequency of stream discharge due to interception of groundwater flows by road cuts; and
- consolidation and redirection of flows by road drainage structures.

Riparian Management Areas

Protection measures for fisheries resources in the Indian River Timber Sale(s) project are based on a Riparian Management Area (RMA) strategy. (See the 1997 TLMP for definitions, standards and guidelines pertaining to RMAs. See also the Fish and Vegetation sections in this chapter and in Chapter 3 for further discussion of Riparian Management Areas.) Within the Project Area, RMAs are delineated in portions of the Indian River, 10-Mile Creek, and Freshwater Creek watersheds, where the potential direct or indirect effects from management activities on fish habitat are the greatest.

The underlying strategy for protection is to strictly limit timber harvest and road construction in Riparian Management Areas. Recommended strategies also account for the effects of past activities on riparian areas, wetlands and sensitive soils, and the potential for these effects to be magnified through natural disturbances (e.g., mass wasting and windthrow). Future management in the analysis area also strives to maintain the undisturbed state of fen wetlands.

Windfirmness of Stream Riparian Buffers

Edges of harvest units, including stream riparian buffer strips, are prone to damage from wind. Probability of windfirmness can be increased by a method of tree removal called "feathering," in which larger trees are removed and nonmerchantable trees are retained adjacent to stream buffers. (See Fish section in Chapter 3 for definition of stream buffers.) Proposed future timber harvest units or road corridors located near or within Riparian Management Areas have been designed to minimize blowdown risks. Specific buffer strips where feathering is recommended are noted on the unit cards (see Appendix J).

Table 4-5 lists projected miles of stream buffers resulting from the activities in all alternatives. With the Riparian Management Area strategy, stream buffer strips, the application of Best Management Practices, and using feathering and other methods to maintain windfirmness, quantifiable effects on fish habitat are not expected in any of the alternatives.

Table 4-5
Miles of Stream Riparian Buffers Adjacent to Units

	New Stream Buffers (Miles) by Alternative				
VCU	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
2041	0.7	0.7	0.7	0	7
2160	2.3	2.6	2.6	13	20
2200	0.4	0.4	0	13	20
2220	1.1	1.5	1.5	14	21
Totals	4.5	5.2	4.7	8	15

Source: Kelliher 1996

Roads

The total acres/miles of roads and corridors within riparian areas and the number of stream crossings are used to display a comparison of potential impacts to fisheries and water quality. Table 4-6 displays the distribution of the cumulative totals of existing and new roads that would impact the riparian areas in each VCU by alternative. The range of total riparian acres (44.5 to 47.1) associated with new roads represents only 0.1 percent of the Project Area stream riparian acres.

Under any of the alternatives, additional road acres within riparian areas would be less than one percent of the total riparian acres within a single watershed. Changes in riparian functions (large woody debris input, temperature moderation, nutrient input, and bank stabilization) due to new road corridors from any of the alternatives would be negligible on a watershed scale.

Table 4-6
Existing and New Roads in Stream Riparian Buffers by VCU and Alternative

VCU	Alt. A Existing Road Miles (acres)	Cumulative Road Miles/Acres in Stream Buffers				
		Alt. B Miles (acres)	Alt. C Miles (acres)	Alt. D Miles (acres)	Alt. E Miles (acres)	Alt. F Miles (acres)
2041	0.0 (0.0)	0.0 (0.0)	0.04 (0.24)	0.04 (0.24)	0.0 (0.0)	0.04 (0.24)
2160	2.0 (12.4)	2.4 (14.5)	2.9 (17.3)	2.9 (17.3)	2.8 (16.7)	2.9 (17.3)
2200	3.4 (20.8)	3.7 (22.2)	3.6 (21.8)	3.4 (20.8)	3.6 (21.8)	3.7 (22.2)
2220	1.1 (6.8)	1.3 (7.8)	1.3 (7.6)	1.4 (8.4)	1.2 (7.5)	1.2 (7.5)
Totals	6.6 (39.9)	7.4 (44.5)	7.7 (46.9)	7.7 (46.7)	7.6 (45.9)	7.8 (47.2)
Percent Increase		12%	17%	17%	15%	18%

Source: Kelliher 1996
Note: Temporary roads are included in these figures.

Under all action alternatives, some stream habitat would be impacted by roads at stream crossings. The number of fish stream crossings in each alternative is a measure of potential effects on aquatic resources. Table 4-7 displays new fish stream crossings in each VCU, by alternative. As stated earlier, with application of BMPs, quantifiable effects on fish resources are not expected in any of the alternatives.

Table 4-7
Stream Crossings by Stream Class and Alternative

Stream Class	Alt. A (Existing Crossings)	Proposed (Additional) Stream Crossings				
		Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Class I	54	3	4	2	4	4
Class II	34	19	26	26	24	27
Class III	13	6	11	9	11	12
Total	101	28	41	37	39	43
Sensitive Crossings *	17	4	5	4	5	6

Source: Kelliher 1996
* Sensitive crossings are associated with Alluvial Fan and several High Gradient Contained channels. These channel types present a management concern due to dynamic channel shifting or heavy bedload movement. Due to these factors, the crossing structure type (bridge or culvert), location of the structure, and planned maintenance level are crucial on these streams.

Note: Temporary road crossings are included in these figures.

Recreational Fisheries

Executive Order 12962 of June 7, 1995, directs Federal agencies to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. Section 1 of the Order directs the agencies to evaluate effects on aquatic ecosystems and recreational fisheries, develop and encourage partnerships, promote restoration, and provide access and promote awareness of opportunities of recreational fishery resources. The effects of the alternatives have been evaluated throughout this document, including effects to aquatic ecosystems and recreational fisheries.

The Indian River juvenile chinook stocking discussed in the Fish Habitat section of Chapter 3 has been a cooperative project between the Alaska Department of Fish and Game (ADF&G), Northern Southeast Regional Aquaculture Association (NSRAA), and the Forest Service. This project has produced chinook salmon for sport fisheries in the Tenakee Inlet area, including the lower Indian River freshwater fishery. There are currently plans to construct a fish pass over the barrier falls at Indian River to provide passage to the upstream habitat for native coho salmon and possibly stocked chinook salmon. This could greatly enhance the recreational fishing in Indian River. Depending on road management objectives and interest by user groups, other partnerships may be possible in the Project Area for recreational fisheries.

Under all alternatives except D, road access would be improved from Sunny Cove (near the East Tenakee trail) up Indian River and to the Upper Freshwater and 10-Mile Creek drainages. This would continue to provide access to the small ponds in the Indian River valley which contain resident Dolly Varden char. Most recreational fishing is expected to remain at saltwater however, so the impact of improved access on recreational fishing opportunities is expected to be minor.

Vegetation

Direct, Indirect and Cumulative Effects

Old-Growth Forests and Timber Harvest

The primary vegetation type impacted by the proposed activities is old-growth forest. The action alternatives would result in the harvest of between 1,665 and 2,521 acres of old-growth. This acreage would be converted to successive stands of younger trees which would be harvested before they mature into old-growth forest. At least 87 percent of the current old-growth, or 76 percent of the 1956 old-growth forest (base line year) would remain in the Project Area under any alternative. All alternatives meet current TLMP direction for retention of old-growth. The proposed harvest would primarily impact western hemlock, mixed conifer, and Sitka spruce plant associations. Mountain hemlock and western hemlock-yellowcedar associations would also be impacted.

The proposed harvest is concentrated on the Steep and Moderately Steep Forested Mountain Slopes, the Coluvial/Fluvial/Coastal Surfaces and the Forested Hills landtype associations (LTAs). Little harvest is identified for the Alpine/Subalpine Summits and Ridges and the Lowland Wetland-Forest Complex LTAs. (See the Vegetation section in Chapter 3 and Appendix H for a full discussion of landtype associations.)

Table 4-8 shows the acres of remaining old-growth by LTA and alternative. Species composition and forest structure vary significantly from site to site (Arsenault and Bradfield 1995; Martin et al. 1995); in order to maintain biodiversity, it is important that old-growth forest remain within the different LTAs.

(Note: For the vegetation analysis of effects, units were treated as clearcuts if more than 50 percent of the unit was prescribed for harvest. Where less than 50 percent of the unit was prescribed for harvest, remaining old-growth acres were calculated by multiplying the total unit acres by the percentage of the unit to be remain unharvested.)

Table 4-8
Acres of Remaining Old-Growth Forest in the Project Area: A Comparison of Action Alternatives, No Action (Alt. A), and Pre-harvest (1956) Acreages, by Landtype Association

Landtype Association	1956 Acres (Pre-harvest)	Remaining Old-Growth Acres (and percentage remaining compared to 1956)					
		Alt. A (No Action)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Alpine/subalpine summits and ridges	633	539 (85.2)	537 (84.8)	537 (84.8)	537 (84.8)	537 (84.8)	537 (84.8)
Brushfields	2,124	*2,144 (100.9)	2,115 (99.6)	2,106 (99.2)	2,107 (99.2)	2,061 (97.0)	2,098 (98.8)
Steep forested mountain slopes	6,477	5,873 (90.7)	5,165 (79.7)	5,130 (79.2)	5,141 (79.4)	5,184 (80.0)	4,867 (75.1)
Mod. steep forested mountain slopes	4,211	3,840 (91.2)	3,476 (82.5)	3,444 (81.8)	3,626 (86.1)	3,453 (82.0)	3,298 (78.3)
Forested hills	306	306 (100.0)	281 (91.8)	281 (91.8)	281 (91.8)	281 (91.8)	281 (91.8)
Colluvial/fluvial/ coastal surfaces	3,615	2,234 (61.8)	2,071 (57.3)	1,978 (54.7)	1,971 (54.5)	2,043 (56.5)	1,935 (53.5)
Lowland wetland-forest complex	1,179	1,132 (96.0)	1,123 (95.3)	1,117 (94.7)	1,121 (95.1)	1,110 (94.1)	1,114 (94.5)
Totals	18,545	16,068 (86.6)	14,768 (79.6)	14,593 (78.7)	14,784 (79.7)	14,669 (79.1)	14,130 (76.2)

Source: Chatham Area GIS, Huecker 1997.
* Differences in GIS data types for 1956 and 1994 (Alt. A) in some cases result in more apparent old-growth acres in 1994 than in 1956.

The percentage of total old-growth forest which would remain in each LTA does not vary greatly by alternative (Table 4-8). In all of the action alternatives, old-growth acreage in the Colluvial/Fluvial/Coastal Surfaces LTAs is the most affected.

Cumulative vegetation effects were analyzed for the Northeast Chichagof area. Harvest is planned for Eight Fathom, Whitestone Harbor, and Kennel Creek areas. No other harvest areas are scheduled before year 2010. It is estimated that 904 acres will be impacted at Eight Fathom and 2,627 acres at Whitestone/Kennel (Regan 1997). By using the same proportions of harvested acres by LTA as for the proposed Indian River Project (Alternative B), an estimate can be made of the cumulative harvest in the Northeast Chichagof area.

Table 4-9 displays the previously harvested and estimated future harvest acres in the Northeast Chichagof area, using the proportional method described above. In calculating previously harvested acres, and planned acres for Eight Fathom and Whitestone/Kennel, it is assumed that the units will be clearcut.

Harvesting timber would result in additional fragmentation of the existing old-growth forest. See the Wildlife section in this chapter for discussion of patch fragmentation. Timber harvest would also result in some windthrow, particularly in old-growth stands which would be exposed to prevailing winds following harvest of adjacent trees.

Table 4-9
Past and Estimated Future Harvest in Northeast Chichagof: Acres Harvested Prior to 1994 and Acres Estimated to be Harvested in Eight Fathom and Whitestone/Kennel Project Areas, by Landtype Association

Landtype Association (LTA)	Previously Harvested Acres	Eight Fathom *	Whitestone/ Kennel *	Total Harvest Acres **
Alpine/subalpine summits and ridges	50	1	4	56
Brushfields	535	20	59	615
Steep forested mountain slopes	5,249	491	1,428	7,168
Mod. steep forested mountain slopes	4,362	254	739	5,355
Forested hills	802	18	51	871
Colluvial/fluvial/ coastal surfaces	6,165	113	327	6,605
Lowland wetland-forest complex	503	6	18	528
Estuaries/beaches	0.31	0	0	0.31
Totals	17,667	904	2,627	21,198

Source: Huecker 1997
* Acres shown are estimates, using the same percentages of harvest by LTA as for Alt. B (the proposed action for Indian River) and multiplying the estimated total harvest acres by these percentages.
** Total acreage does not include acreage proposed for harvest in the Indian River Project.

Wetlands

The Indian River Project action alternatives include some construction of new roads across wetlands. Roading may alter the hydrologic function, cause puddling or substrate compaction, and displace soil or accelerate erosion in wetlands. All of these effects can potentially impair wetland function and values. However, implementation of Best Management Practices would limit roading impacts.

Table 4-10 shows new road miles in wetlands, as delineated by the National Wetlands Inventory (USFWS 1996). Twenty-one to 31 percent of total new road miles would be constructed in wetlands in the action alternatives. The total wetland acres that could be impacted under any of the alternatives is less than one percent of Project Area wetlands.

Table 4-10
Miles of New Road Crossing Wetlands, and Percent of Total Wetlands Crossed by Existing and Proposed Roads, by Alternative and VCU

VCU	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
2041	0	0	0	0	0	0
2160	0	1.2	2.3	2.3	2.3	2.3
2200	0	0.4	0.4	0.4	0.3	0.4
2201	0	0	0	0	0	0
2210	0	0	0	0	0	0
2221	0	0	< 0.1	< 0.1	< 0.1	< 0.1
Total new miles	0	1.6	2.7	2.7	2.6	2.7
Total acres *	0	9.5	16.5	16.5	16.0	16.5
% of total new road mi.		21%	28%	29%	31%	28%
% of total wetlands (6,433 ac.)		0.15%	0.26%	0.26%	0.25%	0.26%
% of total wetlands crossed by existing (5.7 mi.) and proposed roads.	0.54%	0.68%	0.79%	0.79%	0.78%	0.79%

Source: Trull 1997
* Based on a 50-foot road clearing width.

Table 4-11 displays the acres of wetlands in proposed harvest units. Harvest would occur on less than three percent of the total Project Area wetlands in any alternative. Wetlands total less than six percent of the harvest acres under all the alternatives.

Table 4-11
Acres of Wetlands in Proposed Harvest Units, by Alternative and VCU

VCU	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
2041	0	2.4	2.4	2.4	0	2.4
2160	0	26.3	45.9	45.9	45.9	45.9
2200	0	67.6	19.8	0	42.6	92.6
2201	0	0	0	0	0	0
2210	0	0	0	0	0	0
2221	0	1.9	1.2	1.2	1.0	1.9
Total	0	98.2	69.4	49.6	89.5	142.9
% of Total harvest acres *	--	4.5%	3.8%	2.6%	5.4%	5.3%
% of Total wetland acres	--	1.5%	1.1%	0.8%	1.4%	2.2%
% of Total wetlands in existing and proposed units *	0.52%	2.0%	1.6%	1.3%	1.9%	2.7%

Source: Trull 1997
* Acres are calculated as though clearcut.

Wildlife

Direct, Indirect, and Cumulative Effects

This section describes the effects of the project on wildlife habitat and the suitable habitat of critical management indicator species (Sitka black-tailed deer, brown bear, and marten). Effects on other management indicator species (river otter, red squirrel, brown creeper, red-breasted sapsucker, hairy woodpecker, and bald eagle) are also described.

Cumulative effects for this project were evaluated for all of the Northeast Chichagof landscape analysis area, including private land. All past and present timber harvest is included, as well as harvest in the foreseeable future (year 2010). Effects beyond the year 2010 (closed canopy effects) are assessed using 1997 TLMP data (USDA Forest Service 1997a). See the Subsistence section in this chapter for more information.

Wildlife Habitat

Each action alternative includes timber management activities within wildlife habitat. Direct and cumulative effects include reduced wildlife habitat acreage and potential habitat capability. Effects would be reduced by application of the 1997 TLMP management prescriptions, standards and guidelines, best management practices (BMPs), stream buffers, riparian management areas, and unit design criteria (e.g., unit size below 100 acres).

Table 4-12a displays both project and cumulative habitat acreage changes within the Project Area; the table compares each action alternative, as well as pre-harvest conditions (1956) and the no-action alternative (Alternative A). Table 4-12b displays cumulative habitat acreage changes for each action alternative in relationship to all of Northeast Chichagof Island.

Beach and Estuary Fringe Habitat. Construction of a new log transfer facility in the 10-Mile Creek drainage (Alternatives B and D) would result in reductions of 0.1 percent of beach fringe habitat and 0.6 percent of estuary fringe habitat in the Project Area. These habitats would remain unaffected in all other alternatives (Table 4-12a). Cumulatively, reductions in these two habitats across the Northeast Chichagof landscape area are too small to measure, resulting in no change (Table 4-12b).

Table 4-12a
Acres Impacted by Past and Proposed Logging and Cumulative Percent of Project Area Habitats Impacted Under Each Action Alternative

Habitat Type	1956 Acres (100%)	Alt. A Acres and % Impacted prior to 1996	Alt. B Acres (Cum. %)	Alt. C Acres (Cum. %)	Alt. D Acres (Cum. %)	Alt. E Acres (Cum. %)	Alt. F Acres (Cum. %)
Beach Fringe	941	201 (-21.4)	2 (-21.5)	0 (-21.4)	2 (-21.5)	0 (-21.4)	0 (-21.4)
Estuary Fringe	507	7 (-1.4)	3 (-2.0)	0 (-1.4)	3 (-2.0)	0 (-1.4)	0 (-1.4)
Old-Growth	21,156	2080 (-9.8)	2139 (-19.9)	2078 (-19.7)	1788 (-18.3)	1618 (-17.5)	2624 (-22.2)
Second-Growth	168	2228 (+1229.6)	2162 (+2519.3)	1937 (+2485.5)	1634 (+2304.4)	1475 (+2209.4)	2489 (+2814.4)
Alpine/ Sub-Alpine	2,059	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Riparian	4,422	1330 (-30.1)	274 (-36.3)	316 (-37.2)	318 (-37.3)	189 (-34.4)	353 (-38.1)

Source: Suminski 1996

Table 4-12b
Cumulative Acres and Percent Change of Northeast Chichagof Island Habitats Impacted by Alternative

Habitat Type	1956 Acres (100%)	1996 Acres * (% Change)	Alt. B Acres (% Change)	Alt. C Acres (% Change)	Alt. D Acres (% Change)	Alt. E Acres (% Change)	Alt. F Acres (% Change)
Beach Fringe	10,916	10,201 (-7%)	10,199 (-7%)	10,201 (-7%)	10,199 (-7%)	10,201 (-7%)	10,201 (-7%)
Estuary Fringe	8,846	8,210 (-7%)	8,207 (-7%)	8,210 (-7%)	8,207 (-7%)	8,210 (-7%)	8,210 (-7%)
Old-Growth	157,905	137,125 (-13%)	137,986 (-15%)	135,047 (-15%)	135,337 (-14%)	135,508 (-14%)	134,502 (-15%)
Second-Growth	6,848	27,400 (400%)	29,561 (432%)	29,505 (431%)	29,201 (426%)	29,042 (424%)	30,056 (439%)
Alpine/ Sub-Alpine	12,547	12,547 (0%)	12,547 (0%)	12,547 (0%)	12,547 (0%)	12,547 (0%)	12,547 (0%)
Riparian	24,164	17,197 (-29%)	16,923 (-30%)	16,881 (-30%)	16,878 (-30%)	17,008 (-30%)	16,844 (-30%)

Source: Suminski 1996
* Note: Alternative A (No Action)

Old-Growth Habitat. Since the majority of harvest will occur in old-growth habitat, reduction in habitat is proportional to the acreage harvested. Alternative F, in which the largest number of acres are harvested, will result in the largest reduction (12.4 percent), followed by Alternative B (10.1 percent), Alternative C (9.9 percent), Alternative D (8.5 percent), and Alternative E (7.7 percent). (See Table 4-12a.) Cumulatively, across the Northeast Chichagof landscape area, the reduction in this habitat is estimated to be one to two percent (Table 4-12b).

Second-Growth Habitat. Old-growth habitat would be converted to second-growth habitat in all action alternatives. Alternative F would convert the most. Alternative E would convert the least (Table 4-12a). Cumulatively, across the Northeast Chichagof landscape area, the increase in this habitat is estimated to be between 24 and 39 percent (Table 4-12b).

Alpine/subalpine habitat. There would be no harvest or road building activity in the alpine/subalpine habitat type in any of the alternatives. Correspondingly, there would be no change from the present condition in the Project Area or in the Northeast Chichagof landscape area (Tables 4-12a and 4-12b).

Riparian Habitat. Reductions in riparian habitat would occur in all action alternatives, corresponding to the acreage harvested in lower elevation areas near streams outside of buffers. The largest reduction (8.0 percent) would occur in Alternative F, followed by Alternative B (6.2 percent), and Alternative E (4.3 percent). (See Table 4-12a.) Cumulatively, across the Northeast Chichagof landscape area, the reduction in this habitat is estimated to be one percent (Table 4-12b).

Fragmentation

The action alternatives were analyzed to assess the condition and trend of old-growth habitat distribution and size. In all of the action alternatives, the greatest cumulative effect would be the fragmentation of large patches into smaller patches. Table 4-13a displays acres and percent change of patches by alternative cumulatively for Northeast Chichagof Island.

One example of the effects of fragmentation is the increase in edge habitat acres, and the corresponding decrease in interior old-growth habitat. Interior old-growth species (e.g., marbled murrelets) are faced with reduced habitat and increased competition from edge species (e.g., crows and ravens). Of the total interior old-growth habitat in 1956, 78 percent was contiguous (123,191 of 158,293 acres). By 1996, this percentage dropped to 60 percent (82,600 of 137,825 acres). The action alternatives would result in another five percent or less decrease in the contiguous old-growth habitat acres (see Table 4-13b).

Old-growth Habitat LUDs in the Project Area and throughout the Tongass National Forest, along with beach and estuary fringes and other non-development LUDs, serve to mitigate the effects of fragmentation by providing habitat for dependent species.

Table 4-13a
Northeast Chichagof Landscape Analysis Area Cumulative Effects:
Old Growth Patch Acres in 1956 Compared to 1996 and Action Alternative Acres

Patch Size Class in Acres	Old Growth Patch Acres						
	Yr. 1956 Acres	Alt. A Acres (Yr. 1996)	Alt. B Acres	Alt. C Acres	Alt. D Acres	Alt. E Acres	Alt. F Acres
0 to 25 Ac.	848	1,912	2,108	2,126	2,076	2,160	2,186
26 to 75 Ac.	1,319	2,624	3,213	3,244	3,244	3,179	3,307
76 to 200 Ac.	1,327	4,236	5,402	5,046	5,046	4,749	5,046
201 to 500 Ac.	783	4,759	6,385	5,421	5,421	5,938	5,959
501 to 1,600 Ac.	580	11,399	15,207	16,523	15,207	16,345	16,181
1,601 to 2,500 Ac.	0	5,533	5,533	5,533	5,533	5,533	5,533
2,501 to 10,000 Ac.	0	42,828	41,069	41,137	42,993	41,837	39,887
> 10,000 Ac.	143,179	38,657	26,876	26,876	26,876	26,876	26,876

Source: Suminski 1996

Table 4-13b
Northeast Chichagof Landscape Analysis Area Cumulative Effects:
Core and Edge Old-Growth in Acres and Percent of Change in 1956 Acres

Type	1956 Acres	1996 Acres * (% Change)	Alt. B Acres (% Change)	Alt. C Acres (% Change)	Alt. D Acres (% Change)	Alt. E Acres (% Change)	Alt. F Acres (% Change)
Core	123,191	82,600 (-33 %)	76,554 (-38 %)	76,858 (-38 %)	77,397 (-37 %)	77,543 (-37 %)	75,995 (-38 %)
Edge	35,102	55,225 (57 %)	57,996 (65 %)	57,758 (65 %)	57,512 (64 %)	57,528 (64 %)	58,079 (65 %)
Total	158,293	137,825 (-13 %)	134,550 (-15 %)	134,616 (-15 %)	134,909 (-15 %)	135,071 (-15 %)	134,074 (-15 %)

Source: Suminski 1996
* Note: Alternative A (No Action)

Suitable Habitat and Management Indicator Species (MIS)

Habitat models were designed to evaluate timber harvest impacts on suitable wildlife habitat. The models give harvested areas the same habitat suitability value regardless of the harvest method proposed (e.g., clearcutting vs. partial harvest). As a result, the effects indicated by the models are more severe than would actually be expected, particularly in areas where the harvest method leaves a large percentage of the unit standing. For example, units that have as little as 10 percent of the timber volume removed were modeled as if they were clearcut. Suitable habitat impacts have been adjusted to reflect effects from partial harvests in the deer and marten models. The model outputs were multiplied by the percentage of acres harvested to show the reduced impact of the alternative silvicultural prescriptions.

Table 4-14 summarizes the acres and percent change in suitable habitat by species and alternative for the Project Area. All species are expected to have viable populations well distributed on Northeast Chichagof Island, despite potential reductions in suitable habitat as high as twenty percent for some species in some alternatives.

Specific and general standards and guidelines in the 1997 TLMP (USDA Forest Service 1997) are designed to reduce, minimize, or avoid adverse affects to the Management Indicator Species (MIS), as well as other species of concern. For most old-growth-associated species not specifically assessed here, it can be assumed that, to the extent that functional and inter-connected old-growth ecosystems are maintained, the various specific habitats within them that are important to these species would also be maintained.

Table 4-14
Acres of MIS Suitable Habitat in the Project Area and Percent Reduction by Alternative

Species	Alt. A No Action	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Sitka Black-tailed Deer *	20,819	19,778 (5%)	19,570 (6%)	19,778 (5%)	19,986 (4%)	19,362 (7%)
Brown Bear	37,177	35,690 (4%)	35,690 (4%)	35,690 (4%)	36,062 (3%)	35,318 (5%)
River Otter	4,330	4,027 (7%)	4,007 (8%)	4,007 (8%)	4,113 (5%)	3,940 (9%)
Marten *	21,569	20,059 (7%)	19,843 (8%)	20,059 (7%)	20,059 (7%)	19,196 (11%)
Red Squirrel	26,325	23,956 (9%)	23,956 (9%)	24,482 (7%)	24,482 (7%)	23,429 (11%)
Brown Creeper	8,380	7,291 (13%)	7,374 (12%)	7,542 (10%)	7,626 (9%)	7,039 (16%)
Red Breasted Sapsucker	24,071	20,942 (13%)	20,942 (13%)	21,423 (11%)	21,664 (10%)	20,220 (16%)
Hairy Woodpecker	17,190	14,440 (16%)	14,611 (15%)	15,127 (12%)	15,127 (12%)	13,752 (20%)
Bald Eagle	2,840	2,613 (8%)	2,584 (9%)	2,584 (9%)	2,670 (6%)	2,528 (11%)

Source: Shipley 1996
* Figures are adjusted to account for partial harvest.

Sitka Black-tailed Deer - ***Odocoileus hemionous sitkensis***
The model results show that Alternative E would reduce suitable deer habitat the least (Table 4-14). This alternative would also have less impact because of the effort to avoid harvesting low-elevation south-facing stands. Alternative F would have the largest impact because of the higher volume and acreage harvested. Habitat capability (currently 963 deer) would decline correspondingly to 915 deer in Alternatives B and D, 905 in Alternative C, 924 in Alternative E, and 896 in Alternative F.

Brown Bear ***Ursus arctos***
The bear model shows that Alternative E would result in the least reduction in suitable bear habitat (Table 4-14). Alternative F would harvest more old-growth habitat, which is important to bears, and so would have the greatest suitable habitat reduction.

On September 30, 1997, the Forest Service consulted with the Alaska Department of Fish and Game (ADF&G) concerning identifying and managing important brown bear foraging sites in the Project Area (1997 TLMP, Bear Habitat Management Standard and Guideline B, page 4-114). ADF&G identified the lower reaches of Indian River below the falls, the lower reaches of 10-Mile Creek, and the area around the intersection of Road Nos. 7500 and 7502 in VCU 2160 as potentially important foraging sites. (The latter site was important due to large numbers of bears traveling through the area on their way to other places.)

There are no harvest units in any of the alternatives near the falls on Indian River. Harvest units along the lower reaches of 10-Mile Creek and near the intersection of Roads 7500 and 7502 either have sufficiently wide buffers, or are more than 500 feet from fish streams, to meet the standard and guideline.

River Otter - ***Lutra canadensis***
Habitats immediately adjacent to coastal and fresh water aquatic environments are preferred by river otters. Old-growth forests in these areas provide the highest value habitat, providing cover and burrow and den sites. Non-development old-growth LUDs, beach and estuary fringes, streamside buffers, riparian management areas and other standards and guidelines in the Project Area and Northeast Chichagof Island increase the probability of maintaining viable, well-distributed populations over the short and long term.

The suitable habitat model indicates that Alternative E would have the least reduction in suitable habitat for otter and Alternative F would have the greatest reduction (Table 4-14). Alternative E minimizes the amount of low elevation harvest near riparian areas while Alternative F has the most low elevation cutting, especially in the 10-Mile Creek drainage.

Red Squirrel - ***Tamiasciurus hudsonicus***
Old-growth Sitka spruce forests in Southeast Alaska provide optimum habitat for red squirrel. However, the species also does fairly well in second-growth timber stands at seed-producing age. Model results indicate that Alternative E would have the least reduction in suitable habitat for red squirrel and Alternative F would have the greatest reduction (Table 4-14). These species habitats are conserved by applying the reserve tree/cavity-nesting standards and guidelines. Application of these measures would increase the probability of maintaining viable, well-distributed populations over the short and long term.

Marten - *Martes americana*

Harvesting old-growth forest would decrease habitat for marten, by reducing the number of resting and winter hunting sites, the amount of overhead cover, and preferred prey (Suring 1993). Clearcuts retain some habitat value, since residual slash provides overhead cover and some less-preferred prey species are available. Research results indicate, however, that actual clearcut use by marten is very limited in Southeast Alaska (Suring 1993). The model shows that Alternative E would have the least reduction in suitable habitat for marten and Alternative F would have the greatest reduction (Table 4-14).

The 1997 FORPLAN analysis identified areas in the high risk East Chichagof Island biogeographic province in which over 33 percent of the productive old-growth (POG) may be converted to young harvest stands by year 2095. Within the Project Area, only one such VCU (VCU 2220) was identified. Table 4-14a displays VCU 2220 acres of POG in 1954 and 1997; percent to be harvested by the Eight Fathom selected alternative; percent harvested by the Indian River alternatives; and the 2095 cumulative projection.

Currently, 14.2 percent of the POG in VCU 2220 has been converted to young harvest stands. The Eight Fathom Project will increase this percentage to 20.4 percent. The Indian River Project increases the percentage to 22.8 percent in Alternative B, 24.5 percent in Alternatives C and D, 23.5 percent in Alternative E, and 24.0 percent in Alternative F. These figures are well below the 33 percent level that would require additional restrictive standards and guidelines. The 1997 TLMP projects that VCU 2220 will have 39.6 percent of the POG converted to young stands by 2095 if current harvest rates are maintained. If future timber sales reach the 33 percent level, the more restrictive standards and guidelines would apply.

Although not required for this project by the 1997 TLMP Record of Decision (USDA Forest Service 1997b, page 41), the new Forest-wide standards and guidelines for marten in VCUs where less than 33 percent of the POG has been harvested have been applied. Applicable standards and guidelines include: retaining approximately 10 to 20 percent of the original stand structure (all clearcut with retention harvest units will retain at least 10 percent of the canopy within the harvest unit), retaining an average of at least four large trees per acre for future snag recruitment, retaining an average of atl east three large decadent (dead or dying) trees per acre, and retaining an average of at least three pieces per acre of down material (logs) generally distributed throughout the harvest unit.

The Forest Service met with representatives from the interagency implementation team to review the extent to which this new marten standard and guideline should be incorporated into the Indian River Project. The new standard and guideline is being fully applied in this project. (Note: the interagency meetings were held on September 23, 1997 with the U.S. Fish and Wildlife Service, Alaska Division of Governmental Coordination, Department of Fish and Game, and Department of Environmental Conservation; and on October 10, 1997 with the National Marine Fisheries Service and the Environmental Protection Agency.)

Table 4-14a
VCU 2220 Acres of Productive Old-Growth (POG) in 1954 and 1997, Eight Fathom POG Harvest %, Indian River POG Harvest by Alternative, and Projected POG Harvested % in 2095

VCU	POG Acres 1954	POG Acres 1997	POG % Harvested	8 Fathom POG % Harvested	Indian River Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	POG % Harvested 2095
2220	6,635	5,696	14.2%	6.2%	0%	2.4%	4.1%	4.1%	3.1%	3.6%	39.6%

Source: Shipley 1997

Note: All clearcuts in VCU 2220 were assumed to be high volume/high quality marten habitat. Actual volume/marten habitat may be lower, resulting in lower percentages.

Brown Creeper - ***Certhia americana***
Brown creepers are dependent on high volume old-growth timber, with tree size being more important than tree species. As a result, brown creeper can be affected by timber harvest. Model results indicate that Alternative E, which minimizes the amount of low elevation and high volume harvest, would reduce suitable habitat for this species the least (Table 4-14). Alternative F has the most low elevation cutting and high volume harvest, especially in the 10-Mile Creek drainage, and so would have the greatest reduction.

These species habitats are conserved by applying the reserve tree/cavity-nesting standards and guidelines. Application of these measures would increase the probability of maintaining viable, well-distributed populations over the short and long term.

Red-Breasted Sapsucker - ***Sphyrapicus ruber***
The red breasted sapsucker suitable habitat model gives the highest value to low volume old-growth (8,000 to 20,000 board feet per acre), based on studies done in Southeast Alaska. Clearcuts and second-growth have no habitat value in the model. Correspondingly, model results indicate that Alternative F, which harvests the most low volume harvest habitat, would reduce suitable habitat the most (Table 4-14). Alternative E, which harvests the least amount of low volume habitat, would have the least reduction.

The model likely overestimates the effect of timber harvest, since it considers all units to be clearcut, and assigns no habitat value to clearcuts. Alternate methods of harvest would actually have less impact than clearcutting. These species habitats are conserved by applying the reserve tree/cavity-nesting standards and guidelines. Application of these measures would increase the probability of maintaining viable, well-distributed populations over the short and long term.

Hairy Woodpecker - ***Picoides villosus***
Hairy woodpeckers prefer high volume old-growth forest habitat for foraging and nesting (Suring 1993). During the regeneration stage of even-aged timber stands, forests have little potential for hairy woodpecker habitat (Suring 1993). Model results indicate that Alternative E, which minimizes the amount of low elevation and high volume harvest, would reduce suitable habitat for this species the least (Table 4-14). Alternative F has the most low elevation cutting and high volume harvest, especially in the 10-Mile Creek drainage, and so would have the greatest reduction. These species habitats are conserved by applying the reserve tree/cavity-nesting standards and guidelines. Application of these measures would increase the probability of maintaining viable, well-distributed populations over the short and long term.

Bald Eagle - ***Haliaeetus leucocephalus***
The non-development LUDs (Old-growth Habitat) and bald eagle, riparian, and beach and estuary fringe Forest-wide standards and guidelines (USDA Forest Service 1997) are specifically designed to protect nesting habitat. This protection extends through time as well as across the Northeast Chichagof Island landscape area. Application of these measures would increase the probability of maintaining viable, well-distributed populations over the short and long term.

Model results indicate that Alternative E would reduce suitable habitat for bald eagle the least (Table 4-14). Alternative F would have the greatest reduction. The model reflects the reduction in the quality of foraging areas near riparian habitats.

Nesting bald eagles are vulnerable to human disturbance. However, because individual eagles vary considerably in their response to human activity, it is difficult to predict the

effects of specific disturbances (Sidle et al. 1986). Potential disturbance activities of proposed Project actions include road construction, and truck and heavy equipment traffic.

The bald eagle and its habitat are given special protection through an Interagency Agreement between the Forest Service and the U.S. Fish and Wildlife Service (USFWS 1990), and by the Bald and Golden Eagle Protection Act. One bald eagle nest tree is within one-half mile of the road or the proposed LTF at 10-Mile Creek. In Alternatives B and D, these proposed actions would require variance from the Interagency Agreement.

Other Harvest Operations Affecting Wildlife

Helicopters

Helicopters would be used in the Project Area for yarding logs, transporting personnel and equipment in and out of harvest units, and general personnel transport.

The primary concern expressed is that low-level flights over wild animals, especially brown bears and eagles, may cause physiological and/or behavioral responses that reduce the animals' fitness or ability to survive. Helicopter encounters cause direct sound and sight stimuli to wildlife in their natural setting. These include fly-by or over, approach and take-off patterns to landings, hovering, actual landing and sitting with the engine operating, as well as varying levels and types of sounds created by blade pitch and distance of helicopters from the animal.

The effect on wildlife depends on life history characteristics of the species, characteristics of the aircraft and flight activities, and other factors such as habitat type and previous exposure to aircraft. While the behavioral responses by animals to over-flights have been well documented for several species, few studies have addressed the indirect consequences.

According to ADF&G biologists, if the intrusions are infrequent and unpredictable, these impacts would be minimal and non-measurable except for the immediate behavioral responses. However, if a helicopter landed at a locale periodically over the spring (April through May), there seems little doubt that bears frequenting the area would move to another area or change habitats.

Helicopter operations have the potential to disturb eagles. Eagles will vary considerably in their response to human activity. Some pairs will tolerate constant activity near the nest territory, while others will abandon their nests. The interagency agreement between the Forest Service and the USFWS recommends that repeated helicopter flights and helicopter logging be avoided within 1/4 mile of an eagle nest tree. No helicopter logging or repeated flights are planned within 1/4 mile of any bald eagle nest, and no adverse effect to bald eagles is anticipated.

Roads, Logging Camps, and LTFs

Road construction in each action alternative would improve hunter access to the Project Area, which may result in greater hunter success for deer. Since the roads in the Project Area are not linked to a municipal road system, hunters would have to transport vehicles by boat to the remote road system. This increased vehicular access would last until the road is physically closed by removing culverts and bridges or until the road becomes overgrown with alder. Roads left open to vehicles would result in greater impacts than roads closed to vehicular traffic. Closed roads would support hunter access on foot for several years following harvest.

Roads increase access for bear hunters and poachers, as well as the probability of vehicle-bear collisions, defense-of-life-and-property incidents, and the frequency of energy-intensive flight responses by bears (McLellan and Shackleton 1988). Since Project Area

roads would not be linked to any community, the greatest disturbance to bear would occur during road building and timber harvest activity. Vehicles could be transported by boat to roads in the Project Area. Hunting mortalities should be low since current hunting regulations prohibit the use of motorized vehicles to hunt brown bear from the roads on Chichagof Island.

There are two types of effects on wildlife associated with a log transfer facility and logging camp. First, there is the potential loss of wildlife habitat as a result of clearing activities for the camp, sort yard, and associated facilities. Second, and more importantly, there is the disturbance to wildlife as a result of increased human activity. This includes disturbance of wildlife use patterns, increased harvest, and increased human-bear encounters. These effects are minimized when the camp facilities are on a barge (floating camp) as opposed to being located on the uplands. The overall effects of disturbance of the wildlife use patterns are expected to be minor. These effects are addressed in more detail in the Subsistence effects analysis report.

Summary Comparison of Alternatives

The main direct effect on wildlife habitats within the Project Area is reduced suitable habitat for each of the Management Indicator Species (MIS). Alternative F, which harvests the most old-growth forest, would result in the greatest reduction. Both direct and indirect effects on habitat capabilities for MIS would occur under all action alternatives.

Effects have been reduced under all alternatives by identifying Old-growth LUDs, and maintaining a minimum 100-foot stream buffer on all Class I and II streams. The buffers would accommodate animal species like brown bear which are highly dependent on riparian habitats. Other measures to reduce effects include maintaining estuary/beach fringes and Riparian Management Areas, and applying RMOs as specified in Appendix D.

Long-Term Productivity

Long-term impacts on wildlife result from loss of old-growth habitat. Sitka black-tailed deer, brown bear, marten, and brown creeper depend on old-growth, and would experience some reductions in long-term habitat capability. Impacts would be greatest during critical times of the year (e.g., winter for deer). Suitable habitat for brown bear and marten would decline further if roads are left open, resulting in human-related disturbance and mortality. None of the habitat declines are expected to result in any listings or local extinctions.

Long-term impacts also result from canopy closure in second-growth stands, which reduces habitat capability for deer, marten, and brown bear. Thinning second-growth stands could delay canopy closure, and would offset some negative impacts of post-harvest succession. The effects of canopy closure are expected to last from 30 years after harvest until the end of the rotation (approximately 100 years following initial harvest). See the Subsistence section for more information on canopy closure effects. See Appendix F, Figures 7 and 8, for additional information regarding stem exclusion phase effects.

Population Viability

Habitat (especially old-growth habitat) is the key to maintaining viable, well-distributed populations of vertebrate species. Old-growth habitats are conserved in the Project Area and across the Northeast Chichagof Island landscape area in non-development LUDs (Old-growth Habitat) and by application of standards and guidelines (such as beach and estuary fringes) that retain old-growth characteristics.

In the 1997 TLMP Record of Decision, the Regional Forester found that, "Based on the statute, regulation, case law, and examination of the record ... this decision satisfies requirements of the law [NFMA] because it will provide an amount and distribution of habitat adequate to maintain viable populations of vertebrate species in the planning area [Tongass National Forest] and will maintain the diversity of plant and animal communities." (USDA Forest Service 1997b, page 32.)

The TLMP EIS found that the selected alternative (Alternative 11) provides a combination of land allocations that protects 70 percent of the productive old-growth existing in 1954 in natural setting (non-development) LUDs across the entire Tongass National Forest. This compares well with the 73 percent of the productive old-growth in natural resource setting LUDs across the Northeast Chichagof Island landscape area. See Table 4-15 for additional information. Over the long term (year 2095), 57 percent of the productive old-growth that existed in 1954 will still remain in development LUDs such as Timber Production.

Table 4-15
Acres and Percentage of Productive Old-growth (POG) 1954 to 2095 in Reserves and Matrix by WAA, Northeast Chichagof

WAA	POG Acres 1954	POG Acres and % 1995	POG Acres and % Remaining in 2095	% POG in Reserves	% 1954 Matrix POG Remaining in 2095
3523	24,695 100%	21,485 87%	19,509 79%	56%	63%
3524	6,922 100%	6,922 100%	5,953 86%	20%	83%
3525	41,080 100%	34,096 83%	27,934 68%	37%	56%
3526	22,734 100%	20,006 88%	16,823 74%	50%	58%
3551	33,658 100%	29,282 87%	24,234 72%	48%	56%
	129,089 100%	111,791 87%	94,453 73%		

Source: 1997 TLMP EIS, Part 1, page 3-386.
Notes: Reserves are defined as non-development LUDs, such as Old-growth Habitat.
Matrix lands are defined as development land designations, such as Timber Production.
Figures include only productive old-growth from National Forest lands.
The analysis assumes maximum timber harvest levels over the next 100 years.

Other Aspects of Population Viability

The 1997 TLMP Record of Decision (USDA Forest Service 1997b) includes a new standard and guideline to provide corridors of old-growth forest among large and medium old-growth habitat reserves and other natural setting land use designations (LUDs) at the landscape scale. An analysis was conducted to determine to what extent such corridors were provided for in this project.

The analysis showed that forest connectivity exists among old-growth blocks in large and medium reserves and natural setting LUDs (Old-growth Habitat, LUD II, Wilderness, beach and estuary fringes, riparian buffers, and other lands unsuitable for development) on Chichagof Island. Although not required by this standard and guideline, connectivity exists within the Project Area between small, medium, and large old-growth reserves, as displayed in the alternative maps.

The Forest Service met with representatives from the interagency implementation team to review the extent to which the new connectivity standard and guideline should be incorporated into the Indian River Project. (Note: the interagency meetings were held on September 23, 1997 with the U.S. Fish and Wildlife Service, Alaska Division of Governmental Coordination, Department of Fish and Game, and Department of Environmental Conservation; and on October 10, 1997 with the National Marine Fisheries Service and the Environmental Protection Agency.) The new standard and guideline is being fully applied in this project.

Initially the USFWS expressed a desire that the 1997 TLMP standard and guideline should not only require connectivity between the large and medium old-growth reserves, but also connectivity with the small old-growth reserves, across the Tongass National Forest. Following the September 23 meeting, further discussion with the USFWS indicated that, while recognizing that connectivity among all of the old-growth reserves is not a requirement, they strongly encourage consideration being given to enhancing connectivity among reserves when moving small reserves at the project planning level.

The USFWS also suggested moving the Project Area interior small old-growth reserve located in the western portion of VCU 2160 to the eastern portion of the VCU. The intent of moving the small old-growth reserve was to provide better connectivity between VCU's 2150 and 2160.

Appendix N of the 1997 TLMP FEIS (page N-21) describes the Interagency Viable Population Committee (VPOP) management objectives for small old-growth reserves. The management objectives of small old-growth reserves are "to provide temporary functional habitat for animals dispersing between large and medium HCA's and to ensure that species of concern have a relatively high likelihood of occurring in each 10,000+ acre watershed...These small reserves also contribute to the overall landscape matrix outside large and medium HCA's." An analysis of mapped old-growth patches was conducted, which determined that the 1997 TLMP management objectives for small old-growth reserves are being met in all of the alternatives. Moving the interior small old-growth reserve from the western portion of VCU 2160 to the eastern portion was considered; however, the old-growth forest in the USFWS-proposed small old-growth reserve in the eastern portion of the VCU did not meet the specific design criteria for small reserves found in Appendix K of the 1997 TLMP.

The 1997 TLMP Record of Decision (USDA Forest Service 1997b) also includes a new standard and guideline requiring surveys for terrestrial endemic mammals (e.g., shrews, voles, or mice specific to a certain area) on islands less than 50,000 acres in size. At 1,343,463 acres, Chichagof Island far exceeds the small island criteria to survey for terrestrial endemic animals.

However, several small mammal surveys have been completed or are on-going on Chichagof Island. These surveys include the work done by Forest Service wildlife biologists in conjunction with ADF&G's marten study and as part of a planted spruce stock damage survey. In addition, the University of Alaska, Fairbanks, in conjunction with University of Arizona, has conducted small mammal surveys on Chichagof Island. A graduate student also conducted small mammal surveys as part of the Kadashan Study south of the Project Area. None of the surveys have, to this point, identified any rare or endemic terrestrial mammal populations that may represent unique populations with restricted ranges on Chichagof Island.

A search of the literature related to terrestrial mammals on Chichagof Island did not reveal any small rare terrestrial mammals. It is therefore unlikely that endemic species are present that may be affected by this project.

The interagency implementation team reviewed the extent to which the new endemic terrestrial mammal standard and guideline should be incorporated into the Indian River Project. The new standard and guideline is being fully applied in this project.

Threatened, Endangered, and Sensitive Species

Direct, Indirect, and Cumulative Effects

No significant direct, indirect, or cumulative effects are expected from this project. The U.S. Fish and Wildlife Service and National Marine Fisheries Service have concurred with the Biological Assessment/ Evaluation for listed species (see Appendix B).

Wildlife

Steller Sea Lion - Threatened

Harassment or displacement of Steller sea lions from preferred habitats by human activities (boating, recreation, aircraft, LTFs, and log raft towing) is a concern with regard to long-term conservation of the sea lion in Southeast Alaska. LTF construction and operation are unlikely to affect prey availability for Steller sea lions, since these and related activities are restricted to small, very localized areas of the marine environment. In addition, the permitting process for LTFs requires that monitoring be conducted to maintain water quality, marine circulation and flushing during construction and operation. There is no critical habitat (rookeries) near the LTFs or proposed camp location in Corner Bay.

Humpback Whale - Endangered

The only proposed activities likely to result in harassment or disturbance of humpback whales are the development and use of LTFs and their associated camps, and the movement of log rafts from LTFs to mills. Construction and operation of LTFs and other docking facilities are restricted to small, localized areas of the marine environment. Construction and operation of LTFs are unlikely to affect prey availability for humpback whales.

Humpback whales could be disturbed by increased boat traffic associated with LTFs and logging camps. Disturbance impacts would be localized in nature, would be highly variable, and dependent on many factors, such as the size of the bay, water depth, number of boats, and individual behavioral responses of humpback whales. Behavioral responses could include sounding, breaching, evasive underwater maneuvers, and maintaining distance. Minimum separation distances are required by law.

Marbled Murrelet - Sensitive

Marbled murrelets are common in Southeast Alaska and nest in old-growth forest stands up to 53 miles from saltwater. They more commonly occupy larger stands (greater than 500 acres) than smaller stands (less than 100 acres). Since all inland forest stands in the Project Area are less than 53 miles from salt water, all could be potential marbled murrelet nesting habitat. Without precise knowledge of marbled murrelet nesting habitat requirements, all old-growth habitat with greater than 8 mbf per acre is assumed to be suitable for nesting.

All action alternatives would harvest stands which may be capable of providing nesting habitat for these birds. The factors currently limiting marbled murrelets in Southeast Alaska have not been identified. Assuming that availability of nesting habitat is a limiting factor for the population, then a reduction in available nesting habitat could result in a reduction of the population. However, this relationship has not been quantified in Southeast Alaska.

In summary, the Indian River Project may affect marbled murrelets by reducing the amount of suitable nesting habitat, but the extent of this impact cannot be determined at this time. The Project Area is only a small fraction of the suitable habitat in Southeast Alaska, and any effects from this project would have minimal impact on the overall population in Southeast Alaska.

If an active nest is located during timber sale layout or harvest, the 1997 TLMP standards and guidelines specific to marbled murrelets would be implemented (see page 4-117, 1997 TLMP). Protective measures in the standards and guidelines include maintaining a 600-foot radius of undisturbed forest habitat around the nest; minimizing disturbance activities within the buffer during the nesting season (May 1 to August 15); and monitoring the nest site for nesting activity for not less than two nesting seasons after nest discovery.

Northern Goshawk - Sensitive

Harvesting old-growth timber could reduce the quality and availability of nesting habitat for northern goshawk in the Project Area. Types of impacts from timber harvesting could include reduced foraging habitat quality, reduced prey densities, and increased competition from red-tailed hawks and other raptors (Crocker-Bedford 1990). These effects could potentially result in reduced population levels and reduced nesting success of northern goshawks (Crocker-Bedford 1990).

Northern goshawks are known to occur in the Project Area. Forest Service crews located two probable, inactive nest sites during goshawk surveys. Based on three years of intensive surveys, there is high confidence that timber harvest would not remove any active nest trees. There may be a reduction in the number of potential nest trees and a decrease in the amount of forage area of goshawks.

Any northern goshawks not discovered prior to timber harvest may be affected if a harvest unit corresponds to goshawk nesting habitat. In addition, old-growth forest throughout the Project Area provides potential nesting habitat for future nesting activities. Therefore, the Indian River Project could affect northern goshawks and their potential habitat.

If an active northern goshawk nest is located during timber sale layout or harvest, the 1997 TLMP standards and guidelines specific to northern goshawks would be implemented (see pages 4-90 and 4-91, 1997 TLMP). Protective measures in the standards and guidelines include maintaining an area of not less than 100 acres of old-growth forest (if it exists) generally centered over the nest tree or probable nest site; permitting no commercial timber harvest within the 100 acres, although road maintenance may occur; and permitting no continuous disturbance likely to result in nest abandonment within the surrounding 600 feet of the nest site from March 15 to August 15.

The 1997 TLMP Record of Decision (USDA Forest Service 1997b, page 41) added a standard and guideline that applies only to Prince of Wales Island, in VCUs where over 33 percent of the productive old-growth forest has been converted to young conifer stands (e.g., harvested since 1954). The Forest Service met with representatives from the interagency implementation team to review the extent to which this new direction should be incorporated into the Indian River Project. Since the project is not on Prince of Wales Island, the new standard and guideline does not apply and will not be incorporated. (Note: the interagency meetings were held on September 23, 1997 with the U.S. Fish and Wildlife Service, Alaska Division of Governmental Coordination, Department of Fish and Game, and Department of Environmental Conservation; and on October 10, 1997 with the National Marine Fisheries Service and the Environmental Protection Agency.)

Fish

No Federally listed threatened or endangered fish species are known to occur in the Project Area. Therefore, no effects are expected.

Plants

No threatened or endangered plant species occur in the Project Area. Forest Service sensitive plant surveys located populations of choris bog orchid (*Platanthera chorisiana*) in the Project Area. Individual plants may be affected by the actions proposed in the alternatives. However, this is not likely to cause a trend to Federal listing or loss of viability. Other populations in the Project Area are protected and are expected to maintain species viability. The species is also more common than previously estimated, with populations known from outside the Project Area.

Timber

Direct, Indirect, and Cumulative Effects.

Harvest by Volume Strata

Table 4-16 displays harvest acres and volumes by low, medium, and high volume strata for the action alternatives. (See Glossary for definition of volume strata.) Volumes are net sawlog plus utility in million board feet (mmbf). Since Alternative A would not harvest timber under this Project, it is not displayed.

Throughout this section, harvest acres represent total unit acres for all units in a particular alternative. This is true, regardless of what percentage of harvest is proposed for the various units in that alternative. Acres would actually be less than what is displayed, since each action alternative contains units to be harvested by non-clearcut methods. See Appendix E for a list of harvest units by alternative, unit number, acres, volume, harvest method, logging system and percent of unit proposed for harvest.

Table 4-16
Harvest Acres and Volumes by Volume Strata

	Low Volume		Medium Volume		High Volume		Total	
	Acres	Volume (mmbf)	Acres	Volume (mmbf)	Acres	Volume (mmbf)	Acres	Volume (mmbf)
Alt. B	98	0.5	710	6.8	1,077	16.5	1,885	23.8
Alt. C	100	0.6	764	9.2	992	18.9	1,856	28.7
Alt. D	79	0.4	682	8.1	825	15.5	1,586	24.0
Alt. E	118	0.7	700	8.2	847	15.6	1,665	24.5
Alt. F	137	0.8	864	10.4	1,354	25.7	2,355	36.9

Source: Regan and Peterson 1997

Logging Systems

A variety of logging systems was considered for the Indian River Project (see Chapter 2). Each logging system has advantages, disadvantages, and constraints which limit its applicability. Logging systems were selected for the harvest units in the project to capture the advantages of each system within the applicable constraints. As a result, skyline, shovel, and helicopter logging systems are used in each action alternative. Table 4-17 shows a comparison of logging system volumes and acreages for the action alternatives.

The logging system distribution varies for the action alternatives. While helicopter harvest accounts for a relatively high percentage of total unit acres by alternative, actual helicopter harvest volumes make up lower percentages of total alternative volumes. This is due to the high amount of non-clearcut harvest with helicopter, as compared with cable systems.

Table 4-17
Harvest Acres and Volumes by Logging System

	Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
	Volume (mmbf)	Acres	Volume (mmbf)	Acres	Volume (mmbf)	Acres	Volume (mmbf)	Acres	Volume (mmbf)	Acres
Cable	5.3	327	11.7	655	9.4	514	9.6	546	12.9	687
Cable/Helicopter*	1.2	63	2.2	121	1.0	58	1.7	89	1.9	121
Helicopter	16.9	1,467	13.1	990	12.0	930	12.1	975	19.5	1,410
Shovel	0.4	28	1.7	90	1.6	84	1.1	55	2.6	137
Total	23.8	1,885	28.7	1,856	24.0	1,586	24.5	1,665	36.9	2,355

Source: Regan and Peterson 1997
* For harvest units in this category, most acreage would be cable logged, but one or more settings would be logged by helicopter.

Species Composition and Silvicultural Systems

Each action alternative incorporates both even-aged and uneven-aged management. Even-aged management regenerates and maintains stands in which trees of essentially the same age grow together. For this project, even-aged methods are clearcutting with green tree retention, overstory removal, and patch clearcuts. While patch clearcuts technically may be a two-aged system, for the sake of simplicity, they are considered an even-aged method in this project.

Uneven-aged management regenerates and maintains multi-aged (at least three age classes), multi-layered stands by removing either individual or small groups of trees in all age classes. Three or more harvest entries are made over a complete stand regeneration cycle. Uneven-aged methods are single tree selection and group selection. Uneven-aged management has not been formally tested in the hemlock-spruce forest type in Southeast Alaska. The feasibility of applying this silvicultural system under Alaskan climatic and economic conditions is unproven. Harvest unit layout, administration and logging costs for uneven-aged management are substantially higher than for clearcutting. Guldin (1996) reviewed a number of applications of uneven-aged management. He concluded that it usually takes twenty or more years before a scientifically supportable assessment can be made about this system's feasibility in a given forest type.

Table 4-18 shows the proposed harvest acres and volumes by silvicultural method for each action alternative. (Refer to Chapter 2 or the Glossary for descriptions of each method.) Table 4-19 shows species percentages to be harvested, by alternative.

Open conditions created in clearcuts allow both Sitka spruce and western hemlock to regenerate rapidly. Clearcutting with green tree retention would have basically the same effect on species composition as standard clearcutting. Even-aged stands are generally comprised of 10 to 75 percent (by volume) spruce, depending on the soil type and the age of the stand. The volume of spruce in even-aged stands 75 to 100 years after clearcut harvest averages about 50 percent (Taylor 1934) versus 28 percent in existing mature and over-mature stands. Spruce regeneration is further promoted by cable and shovel yarding when compared to helicopter harvest. With the use of silvicultural practices such as precommercial thinning, an additional increase in the spruce component is expected.

Table 4-18
Volume and Acre Comparison of Alternatives by Even and Uneven Aged Silvicultural Systems

	Alt B		Alt C		Alt D		Alt E		Alt F	
	Acres	Volume (mmbf)	Acres	Volume (mmbf)	Acres	Volume (mmbf)	Acres	Volume (mmbf)	Acres	Volume (mmbf)
Even-Age:										
Clearcut w/ Green Tree Retention	813	15.8	1,173	22.9	992	19.2	1,115	20.1	1,461	28.2
Overstory Removal	325	4.2	186	2.5	151	1.9	159	2.2	244	4.0
Patch Cut	118	0.8	167	1.4	120	1.0	85	0.4	326	2.3
Subtotal Even-Age	1,256	20.8	1,526	26.8	1,263	22.1	1,359	22.7	2,031	34.5
Uneven-Age:										
Group Selection	569	2.4	150	0.5	160	0.6	131	0.5	95	0.4
Single Tree Selection	60	0.6	180	1.4	163	1.3	175	1.3	229	2.0
Subtotal Uneven-Age	629	3.0	330	1.9	323	1.9	306	1.8	324	2.4
Total	1,885	23.8	1,856	28.7	1,586	24.0	1,665	24.5	2,355	36.9

Source: Regan and Peterson 1997

Table 4-19
Harvest Species Composition Percentages by Alternative

	Alt. B %	Alt. C %	Alt. D %	Alt. E %	Alt. F %
Western & Mountain Hemlock	81.7	81.9	82.4	83.3	81.7
Sitka Spruce	15.8	15.6	15.0	13.9	15.8
Alaska-Cedar	2.5	2.5	2.6	2.8	2.5

Source: Regan and Peterson 1997

Except for clearcutting with green tree retention, the regeneration methods for this project could influence resultant species composition in different ways. Because they are relatively new to this area, the actual changes are not quantified. The overstory removal and single tree selection methods may result in higher levels of western hemlock in the stands following harvest because the current understory is often dominated by hemlock. Western hemlock has the ability, unlike spruce, to grow under the canopy of larger trees with minimal light. This hemlock understory would be released from competition and likely grow to become the dominant trees in the new stand with mostly hemlock regenerating underneath. Spruce would remain a component of the stand but may be reduced.

The effects from group selection would vary by the size, aspect, orientation, and shape of the groups. In most areas, adjacent unharvested trees surrounding these groups would shade the forest floor. This would reduce growth rates and promote higher levels of hemlock relative to spruce. The larger openings (approximately 2 acres) designed with a shape that minimizes forest edge (circular shape) located on southern exposures may result in levels of spruce similar to clearcuts. This would also vary by the proximity of the group to larger residual trees providing seed. Thinning in these openings would also increase the spruce levels by favoring them as leave trees. The effects from small patch cuts would be similar to those for larger group selection openings. The effects from large patches would be the same as for clearcuts.

Implementing any one of the action alternatives would not result in a major effect on species composition in the second-growth stands. Some changes may occur in individual units, but over the entire area of harvest the changes would be minor for any alternative. Alternative F, which would harvest the most acres and volume by clearcut and patch cut, would also likely have the greatest effect on species composition in the new stands. Some increase in the spruce component could be expected. Alternative C, with the next highest volumes from clearcuts and patch cuts, may result in a higher than current percentage of spruce in the second-growth stands. Alternatives B, D, or E would have little effect on species composition, with Alternative B having the least effect of the action alternatives.

Forest Structure

In the broadest sense, structure is the horizontal and vertical distribution of components of a forest stand. These components include height, diameter, crown layers and stems of trees, shrubs and herbaceous understory, snags, and down woody debris (SAF 1994). The discussion of structure here is limited to tree height and diameter characteristics.

Most second-growth stands following clearcut harvest will exhibit less variation in tree diameter and height than the mature and over-mature stands they replace. At 100 years of age, average diameters for unmanaged second-growth stands will range from 10 inches on medium to 14 inches on high productivity sites (USDA Forest Service 1991). These diameters can be increased with precommercial and commercial thinning.

Overstory removal, patch cuts, group selection, and single tree selection will all produce stands with a wider variety of diameters in the second-growth stand. These methods should provide more structural diversity (wider range of tree heights and diameters) than either the traditional clearcut method, or clearcut with green tree retention.

For the action alternatives, implementing Alternative F, which would harvest the most volume by clearcut, would result in the least structural diversity in the second growth stands. Implementing Alternative B, which would harvest the least volume by clearcut and the most volume by uneven-aged methods, would lead to the most structural diversity in the new stands.

Long-Term Productivity

The effects of all action alternatives on long-term timber productivity would be the conversion of unmanaged, overmature old-growth stands to managed, faster growing second-growth stands.

All stands proposed for harvest are overmature (i.e., in a stage of decline in vigor and soundness). Most are representative of uneven-aged western hemlock stands. Such stands commonly take hundreds of years to develop under natural conditions, unless they are changed by natural stand replacement events such as windthrow or manipulated by intensive forest management practices.

Log quality is determined by the grade and size of a log, and the amount of defect it contains. High grade, large diameter, and low percentage of defect are desirable characteristics. Log quality in second-growth stands is expected to be lower than in mature and over-mature stands, even on sites that have been precommercially thinned. However, total yield per acre is expected to be significantly higher in second-growth stands. ("Yield" refers to the merchantable timber volume that an area has produced or is capable of producing over a given period of time.) The lower quality of the second-growth timber stands will be reflected in the log grades and sizes, with fewer high grade, large diameter logs than existing mature and overmature stands.

The long-term result of precommercial thinning is the production of more useable fiber. Precommercial thinning also allows the option of reducing the harvest age. This is because merchantable size logs are produced sooner on thinned sites than in areas not thinned. An alternative to reducing the harvest age is to produce larger trees in the current or an extended rotation age. This would improve log quality somewhat in producing larger logs that are more valuable for sawtimber.

Total yield per acre and log quality in second-growth would vary by silvicultural method. Overstory removal would produce the highest second-growth yield because of the advanced stage of the regeneration. However, logging damage may reduce log quality. Clearcutting with green tree retention would enable rapid growth rates with the potential to produce large trees. Diseased trees would be removed from the existing stand. Growth following single tree and group selection harvests may be lower than clearcut stands but would still be rapid near the center of the groups where competition from the edge is reduced. Growth following small patch cuts (up to three acres) will generally resemble that of a group selection opening. Growth following large patch cuts (four to ten acres) will resemble that of a clearcut. Log quality would be less where competition reduces growth, and in residual stands where disease such as mistletoe remains.

Cumulative Effects

The current Chatham Area Timber Sale Schedule projects sale activities through the year 2010. This is the date through which cumulative effects to the timber resource are analyzed. Apart from this project, there are no further timber sales planned for the Project Area through year 2010. For the larger Northeast Chichagof Area, the portion of the Eight Fathom Project south of the Portage and the Whitestone/Kennel Creek Project are also considered in the cumulative effects analysis. These are the only other projects now scheduled for this area. Planned harvest beyond the year 2010 will be determined through future timber sale planning on the Chatham Area.

Of the approximately 38,000 acres of non-National Forest lands in the Northeast Chichagof Area, nearly 31,000 acres are owned by the Huna Totem and Sealaska Native Corporations. As of 1996, approximately 7,300 acres of these lands had been harvested, with most of the harvest (approximately 6,800 acres) occurring on Huna Totem lands. If cutting on these lands continues at past levels, approximately 14,500 acres of Native Corporation lands in the Northeast Chichagof Area will be harvested by the year 2010.

The harvest units for the Indian River project encompass different methods as well as amounts of harvest. The most notable is group selection, where approximately 20 percent of a unit's acres would be cut in this entry. Eventually the entire stand would be harvested but the logging is staggered over 160 to 200 years, with a total of four or five entries. This means that approximately 80 percent of the group selection acres would not be considered for harvest before the year 2010 (the projection of these cumulative effects). For purposes of this analysis, however, all previous and planned harvest acres are considered harvested regardless of what percentages of the unit acres are actually prescribed for cutting under this project.

Implementing Alternative F, which would harvest the most acres by 2010, would have the greatest cumulative effect on the timber resource. Alternative E, which would harvest the fewest acres by 2010, would have the least cumulative effect of the action alternatives. Tables 4-20 and 4-21 display the cumulative acres of harvest by alternative for the Project Area and for the Northeast Chichagof Area, respectively. All acreages shown are National Forest lands only.

Table 4-20
Cumulative Acres of Harvest by Year 2010 for the Project Area

	Previous Harvest Acres	Proposed Harvest Acres	Total Harvest Acres	Percent Cumulative Harvest		
				Tentatively Suitable 13,253 Ac. %	Productive Forest Land 13,608 Ac. %	Total Land Area 35,723 Ac. %
Alt. A	2221	0	2221	16.8	16.3	6.2
Alt. B	2221	1,885	4,106	31.0	30.2	11.5
Alt. C	2221	1,856	4,077	30.8	30.0	11.4
Alt. D	2221	1,586	3,807	28.7	28.0	10.7
Alt. E	2221	1,665	3,886	29.3	28.6	10.9
Alt. F	2221	2,355	4,576	34.5	33.6	12.8

Source: Regan and Peterson 1997

Table 4-21
Cumulative Acres of Harvest by the Year 2010 for the Northeast Chichagof Area

	Previous Harvest Acres	Proposed Harvest Acres: 8 Fathom & Whitestone/ Kennel Cr.*	Proposed Harvest Acres: Indian River	Total Harvest Acres	Percent Cumulative Harvest: Tentatively Suitable 105,341 Acres %	Percent Cumulative Harvest: Productive Forest Land 120,644 Acres %	Percent Cumulative Harvest: Land Base 237,478 Acres %
Alt. A	17,888	3,531	0	21,419	20.3	17.8	9.0
Alt. B	17,888	3,531	1,885	23,304	22.1	19.3	9.8
Alt. C	17,888	3,531	1,856	23,275	22.1	19.3	9.8
Alt. D	17,888	3,531	1,586	23,005	21.8	19.1	9.7
Alt. E	17,888	3,531	1,665	23,084	21.9	19.1	9.7
Alt. F	17,888	3,531	2,355	23,774	22.6	19.7	10.0

Source: Regan and Peterson, 1997
All acres are National Forest Lands only
* For the 8 Fathom Project south of the Portage, 13.6 mmbf from 904 acres are proposed for harvest. For the Whitestone/Kennel Creek Project, using the mid-range of target volume estimates and the average volume-to-acres ratio for the Indian River alternatives, approximately 38.9 mmbf from 2,627 acres could be harvested. Acreage figures for both projects represent total unit acres. Actual harvest acres would be fewer, depending on the mix of clearcut and non-clearcut units.

Financial Efficiency Analysis of Timber Harvest

A financial efficiency analysis was done to compare benefits and costs of this timber sale project. This analysis was conducted by subtracting estimated logging and transportation costs (including road construction) for an operator of average efficiency from the pond log value for each action alternative. Pond log values represent the market value for wood products minus the average manufacturing cost for those products. Variations in logging systems, log haul distance, road construction and reconstruction costs, and LTF construction costs affect logging and transportation costs for each alternative.

The following three methods were analyzed for comparison:

1) the midmarket assessment, which is designed to average market fluctuations;
2) the current value assessment, which is used to reflect the most current market conditions; and
3) SNAP analysis (see Chapter 4 Transportation section, Road and Unit Network Analysis).

The Forest Service Handbook directs the use of a mid-market economic assessment to "provide a more consistent economic estimate of the project during the development process" (R10 Supplement 2409.18-97-1, effective June 13, 1997). The midmarket assessment uses the weighted average of quarterly pond log values from the first quarter of 1979 to the quarter in which the Notice of Intent (NOI) is issued (see Table 1-3 in Chapter 1). An allowance of 60 percent of normal profit and risk is also included as a cost and subtracted from the pond log values. The assessment provides estimates of the value of the timber under average market conditions. Stumpage values would be higher under better-than-average market conditions and lower during poor market conditions.

The current value assessment is conducted to reflect recent market conditions. For this assessment, an allowance of 100 percent of normal profit and risk is included as a cost. In recent months, the selling values have been lower than average. Therefore, the current value assessment results are lower than the midmarket. At the time of a timber sale, a more thorough and detailed appraisal will be done. This timber sale appraisal will use the

most up-to-date timber selling values and logging and road costs to determine the net stumpage value.

All three analyses resulted in the same relative rankings. The results of the midmarket assessment and relative ranking of the action alternatives are displayed in Table 4-22. It is important to recognize that these values represent very preliminary approximations to be used for comparison of alternatives only.

Table 4-22
Mid Market Analysis Summary by Alternative: Dollars per mbf

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Sawlog Volume (mmbf)	19.1	23.0	19.2	19.6	29.5
Sawlog + Utility (mmbf)	23.8	28.7	24.0	24.5	36.9
Pond Log Value	$257	$257	$257	$257	$257
Total Harvest Cost	$405	$377	$379	$377	$368
Profit and Risk Margin [1]	$49	$50	$49	$50	$51
Net Stumpage [2]	($197)	($170)	($171)	($170)	($160)
Relative Ranking	5	2/3	4	2/3	1

Source: Regan and Peterson 1997
Note: Parenthesis () indicates negative value.
1. 60 percent of normal profit and risk.
2. Net Stumpage = Pond log values less total harvest costs less profit and risk.

The major factors affecting net stumpage values among the action alternatives are transportation costs (hauling), road construction and bridge costs, and helicopter versus ground-based yarding system costs. Alternatives with longer haul distances, more miles of road construction, more bridges, and more helicopter yarding yield the lowest net stumpage values.

Based on this preliminary analysis, no alternative would result in a positive net stumpage value with the relatively weak current market. The negative mid-market values for these alternatives indicate that they also would be uneconomical based on average market values. Under strong market conditions, some or all of the alternatives may be economic. In recent years, sales with negative mid-market analysis results and negative timber sale appraisal stumpage values have sold. Some of these have sold for over $100 above the minimum bid rate. This indicates that appraisal results alone are not a definitive, final determination of a sale's economic viability. Operator efficiency, competitive bidding, market trends and predictions, and other factors influence timber sale economics.

Proposed Acres of Planting and Precommercial Thinning

Acres proposed for planting and precommercial thinning (past harvest units and surveys of past harvest units) are listed in Chapter 2 and in Appendix C.

Units harvested under this project would be surveyed and evaluated for thinning in 20 to 25 years following harvest. Actual units to be thinned would be decided at that time.

Subsistence

Direct, Indirect, and Cumulative Effects

Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) requires a Federal agency having jurisdiction over lands in Alaska to evaluate the potential effects of proposed land-use activities on subsistence uses and needs. The evaluation determines whether subsistence uses in the Project Area or portions of the Project Area may be significantly restricted by any of the proposed action alternatives.

This evaluation results in two determinations: (1) the direct effects of the action alternatives on subsistence resources, and (2) the cumulative effects of past, present, and reasonably foreseeable activities on subsistence resources over broader geographic areas.

Three data sources are used in this analysis: (1) the Tongass Resource Cooperative Study (TRUCS), which maps subsistence use areas in the Project Area, (2) wildlife habitat capability models, which estimate the Project Area's ability to support wildlife populations, and (3) ADF&G hunter survey data, which are used to estimate future demand for subsistence resources.

The effects of the proposed alternatives were evaluated using the following criteria:

- changes in distribution or abundance of subsistence resources;
- changes in competition from non-subsistence users for those resources; and
- changes in access to subsistence resources.

For some subsistence resources (e.g., furbearers and brown bears), the effects of changes in access are so inseparably related to distribution and abundance as to require presenting jointly in the following discussions. (See Appendix F for additional subsistence information.)

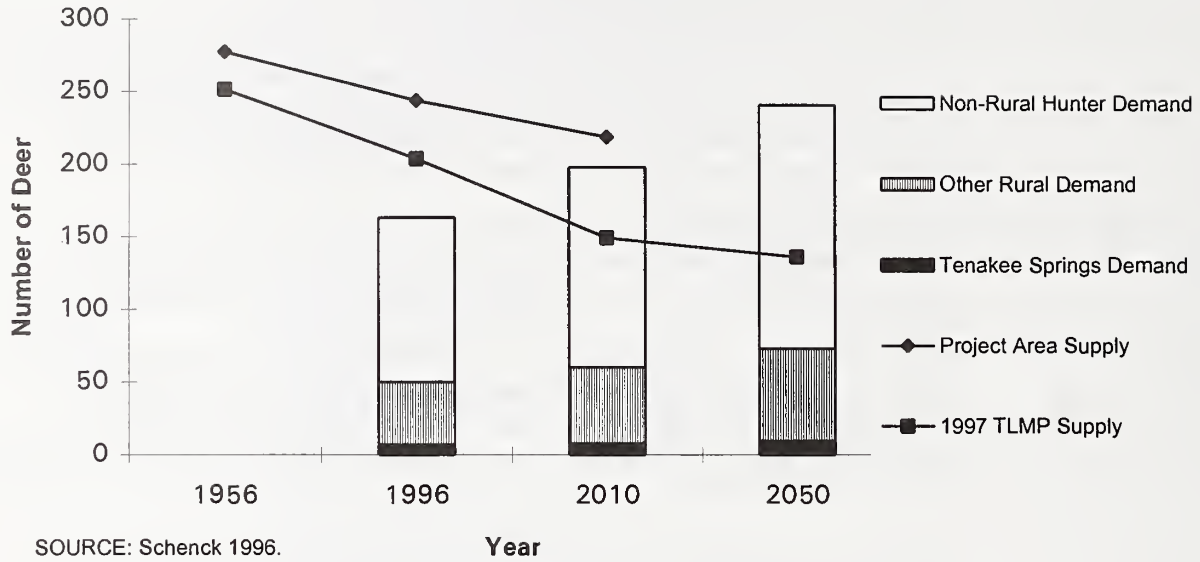
Sitka Black-tailed Deer: Abundance and Distribution

Deer are an important subsistence resource used by rural communities in the vicinity of the Project Area. An analysis of deer habitat capability model estimates and ADF&G hunting information was done to compare the estimated supply and demand for deer. The Project Area encompasses three Wildlife Analysis Areas (WAA) as delineated by ADF&G: 3523, 3525, and 3526. (See subsistence section in Chapter 3, which includes map of WAA boundaries.) Specifically, the analysis examined:

- the estimated effects of the proposed project on each WAA's ability to support deer populations;
- the estimated effects on deer carrying capacity based on implementation of the 1997 Tongass Land Management Plan (1997 TLMP); and
- the projected demand for deer for subsistence and non-subsistence uses if the distribution of hunting activity remains constant, but total demand increases with human population growth.

Current deer habitat capability within the Project Area would be reduced by 7 percent or less under any of the timber harvest alternatives (Table 4-23). Cumulatively, habitat capability reductions in all of WAAs 3523, 3525, and 3526 from past and currently proposed actions range from 8.4 percent in Alternative A (no-action) to 9.7 percent in Alternative F (the action alternative associated with the greatest reduction in deer habitat).

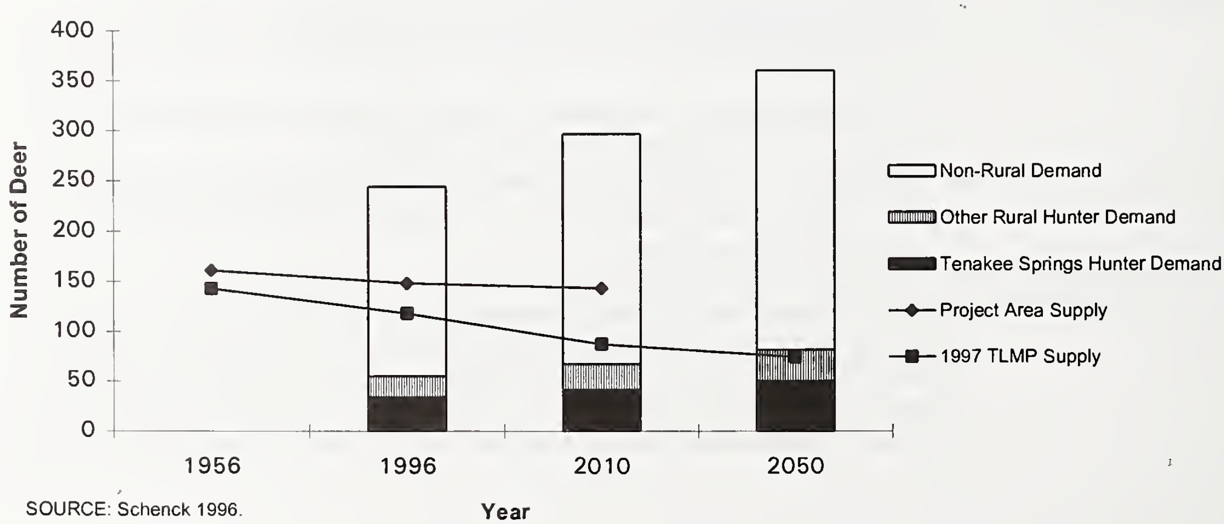
Figure 4-2 WAA 3525 Estimated Deer Supply and Demand



SOURCE: Schenck 1996.

Note: Bars in Figures 4-2 and 4-3 represent estimated and projected deer harvest demands. Harvest demand for 1996 is based on average annual harvest between 1990 and 1995. Projected harvest demand assumes that residents continue to use the areas from which they presently harvest 90 percent of their deer, and demand for deer increases with projected community population growth at 14 percent per decade. The "Project Area Supply" line displays 10 percent of the estimated habitat capability for deer in (1) 1956 before any timber harvest; (2) in 1996; and (3) in 2010 for the "worst case" alternative (Alternative F). The "1997 TLMP Supply" line displays 10 percent (one measure of the harvestable amount) of the current estimated deer habitat capability at years 2010 and 2050.

Figure 4-3 WAA 3526 Estimated Deer Supply and Demand



SOURCE: Schenck 1996.

Analysis results indicate that deer in WAA 3525 are being harvested within sustainable levels (Figure 4-2). The estimated number of deer available for harvest is considered to be sufficient to meet current subsistence and non-subsistence demand. The projected number of deer available for harvest in the years 2010 and 2050 would be sufficient to meet projected subsistence demands, but not projected non-subsistence demands under all alternatives by the year 2010.

WAA 3526 is currently being harvested at greater than sustainable levels (Figure 4-3). The estimated number of deer available for harvest is sufficient to meet current subsistence demand but is insufficient to meet non-subsistence demand. The projected number of deer available for harvest would be sufficient to meet subsistence demands under all alternatives (including the no-action alternative) in the year 2010, but not sufficient to meet increased subsistence demands by 2050.

Subsistence Use of Deer by Rural Communities

Angoon, Hoonah, and Tenakee Springs qualify as subsistence communities and could derive a portion of their deer harvest from the Project Area. Juneau does not qualify as a subsistence community, but does harvest a large percentage of the deer from the Indian River Project Area.

The following community subsistence analysis draws on three data sources: the Tongass Resource Cooperative Study (TRUCS), ADF&G harvest data, and TLMP (USDA Forest Service, 1997). TRUCS data maps of the Project Area are displayed in Appendix F for the rural communities of Angoon, Hoonah, and Tenakee Springs. Each map shows overlap with harvest areas of Hoonah and Tenakee Springs, with the broadest overlap being Tenakee Springs. The alternatives were ranked considering impacts to deer habitat, accessibility, and overlap with current use. The resulting ranking, from lowest to highest impact, is: Alternative D, B, C, E, and F.

The ADF&G harvest data (the comparison by WAA of estimated supply and demand for deer -- Figures 4-2 and 4-3) helped answer the question of whether the proposed project would reduce the number of deer available below projected subsistence demands.

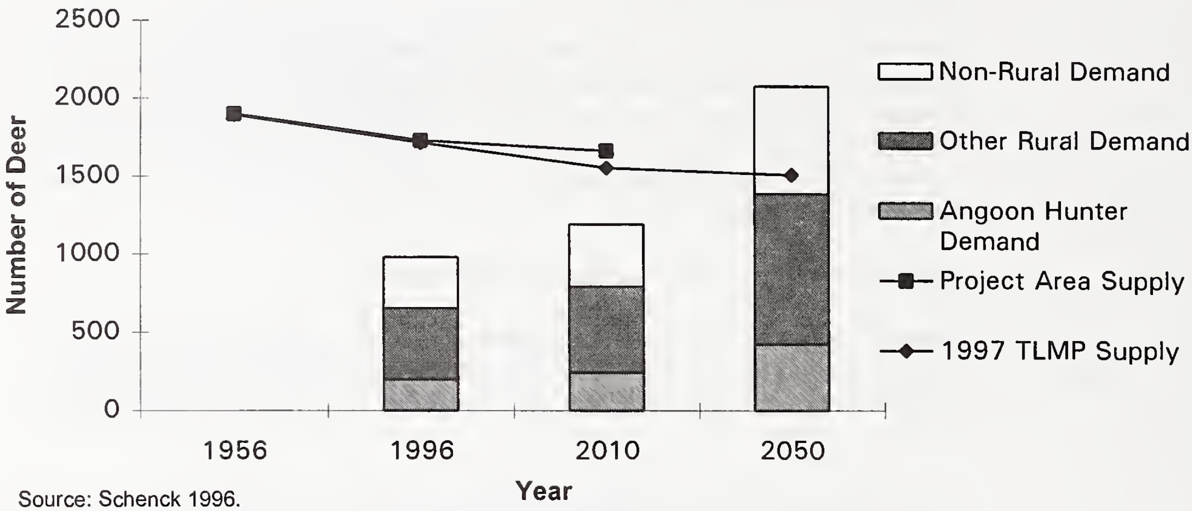
The 1997 TLMP data were used to compare the estimated supply and demand for deer for the area from which a particular community currently harvests 90 percent of its total deer. The figures below include the estimated effects on the area's ability to support deer populations if the 1997 TLMP (USDA Forest Service 1997) is implemented. The figures also display the estimated demand for deer for the same area, assuming demand increases with population growth. These data help answer the question of whether the cumulative effects of past activities, proposed actions, and 1997 TLMP implementation will reduce the number of deer available to a number below subsistence demands in each community's primary use area.

Angoon

Angoon residents usually hunt the shoreline and beach fringe in Freshwater Bay (6 to 15 percent of households) and along Chatham Strait and False Bay (1 to 5 percent of households). There are no harvest units in the area where Angoon residents hunt (see Figure 4-4). Harvest units in VCU 2221 which are nearest to saltwater are adjacent to areas where 1 to 15 percent of Angoon households reported hunting.

Angoon's principal use of the Project Area for deer hunting takes place in WAA 3525. Angoon harvests an average of less than 1 percent of its deer from this WAA. Projected habitat capability is sufficient for both subsistence and non-subsistence use.

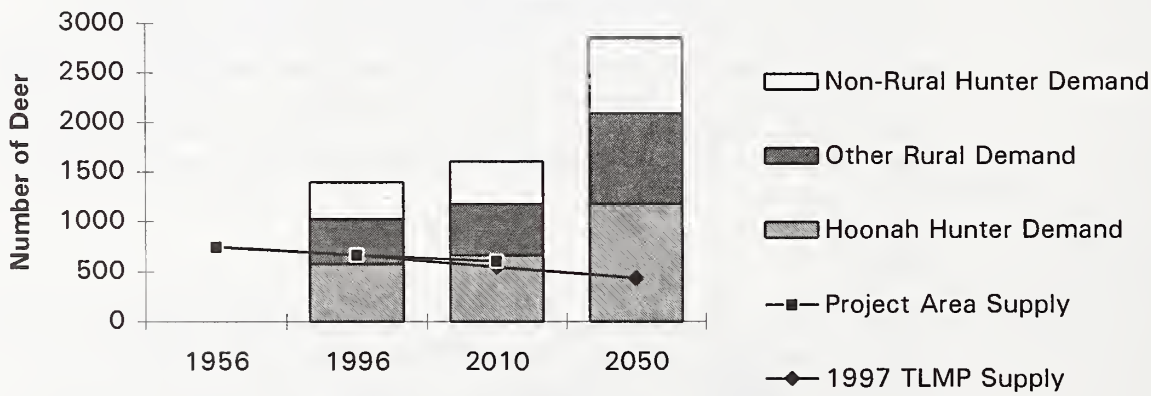
Figure 4-4 Estimated Deer Availability and Demand in Areas Used by Angoon Residents



Source: Schenck 1996.

Note: Bars in Figures 4-4 and 4-5 represent estimated and projected deer harvest demands. Harvest demand for 1996 is based on average annual harvest between 1990 and 1995. Projected harvest demand assumes that residents continue to use the areas from which they presently harvest 90 percent of their deer, and demand for deer increases with projected community population growth at 14 percent per decade. The "Project Area Supply" line displays 10 percent of the estimated habitat capability for deer in (1) 1956 before any timber harvest; (2) in 1996; and (3) in 2010 for the "worst case" alternative (Alternative F). The "1997 TLMP Supply" line displays 10 percent (one measure of the harvestable amount) of the current estimated deer habitat capability at years 2010 and 2050.

Figure 4-5 Estimated Deer Availability and Demand in Areas Used by Hoonah Residents



Source: Schenck 1996.
NOTE: Data is displayed only for those WAAs that accounted for 90 percent of the total deer harvest for this community (WAAs 3523, 3524, 3525, 3351,4222, 4252, and 4253).

Figure 4-4 shows the estimated demand for deer by Angoon residents and other subsistence and non-subsistence users. Also shown is the projected number of deer available for harvest assuming the greatest projected habitat reduction under the action alternatives (Alternative F). None of the alternatives significantly affect Angoon's ability to meet its deer harvest requirements.

Based upon the limited use of the Project Area by Angoon residents and lack of direct project effects on Angoon deer harvesting in the Project Area, there is no significant possibility of a significant restriction of subsistence use of deer by Angoon residents associated with the proposed actions.

Hoonah

Use of the Project Area by residents of Hoonah is not extensive. They harvest about 10 percent of the total community deer harvest from the Project Area. All of the action alternatives include harvest units located in areas used by Hoonah residents for deer hunting (see Appendix F-4B). Overlap of proposed harvest units and roads with areas used by the greatest percentage of Hoonah households (1 to 5 percent of households) occurs in VCU 2160.

Within the Project Area, WAA 3525 currently provides the largest number of deer for Hoonah residents. The data in Figure 4-5 displays the projected number of deer available for harvest under Alternative F. According to the data, supply is sufficient to meet current demand.

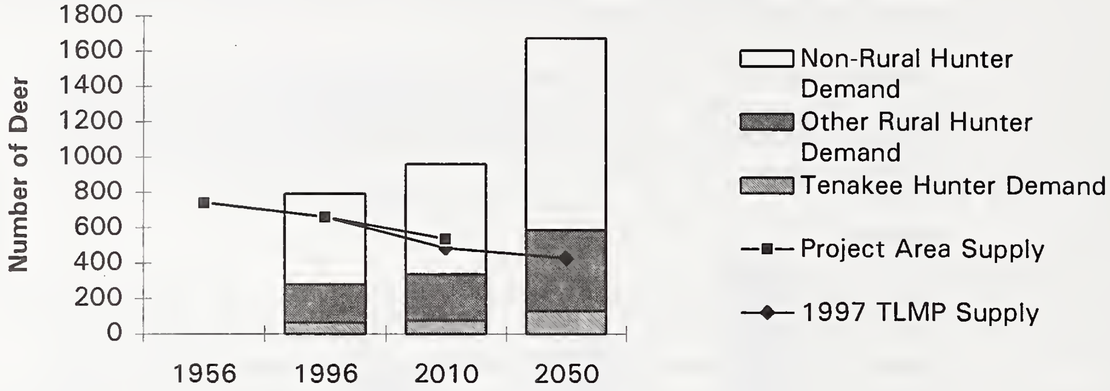
Figure 4-5 also displays the estimated supply and demand for deer in the WAAs that account for 90 percent of the total deer harvest by Hoonah residents and other subsistence and non-subsistence users. None of the Project alternatives significantly affect Hoonah's ability to meet its deer harvest requirements.

In addition, Figure 4-5 shows the estimated deer available for harvest if the 1997 TLMP is implemented. According to these projections, demand continues to increase and habitat capability becomes insufficient to meet projected demand for subsistence uses by the year 2050, assuming subsistence users do not shift their hunting elsewhere.

Implementing any of the action alternatives would reduce the potential number of deer available for harvest. Based on the effects of implementation described above, however, there is not a significant possibility of a significant restriction of subsistence use of deer for Hoonah residents due to this project alone. Cumulatively, there may be such a possibility for Hoonah deer hunters at some time in the future.

It may be possible to minimize the significant possibility of a significant restriction by continuing to regulate non-subsistence uses of areas most heavily used by Hoonah residents for deer hunting.

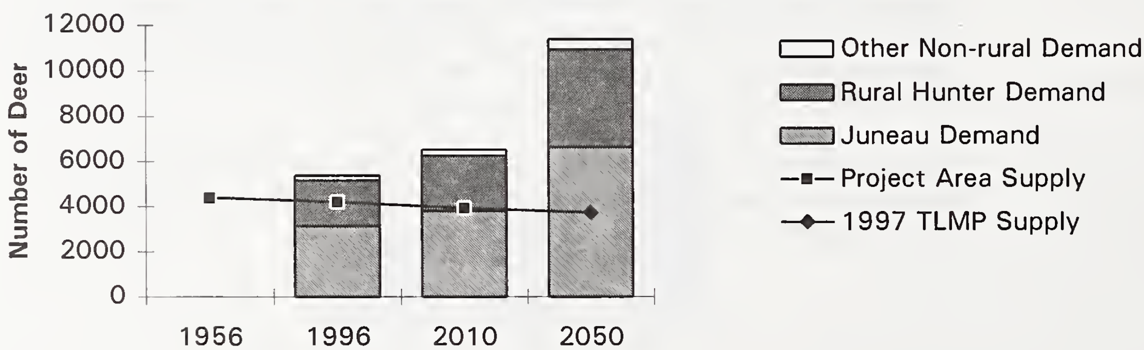
Figure 4-6 Estimated Deer Availability and Demand in Areas Used by Tenakee Springs Residents



SOURCE: Schenck 1996.
NOTE: Data is displayed only for those WAAs that accounted for 90 percent of the total deer harvest for this community (WAAs 3525,3526, 3627, 3628, 3629, and 3630).

Note: Bars in Figures 4-6 and 4-7 represent estimated and projected deer harvest demands. Harvest demand for 1996 is based on average annual harvest between 1990 and 1995. Projected harvest demand assumes that residents continue to use the areas from which they presently harvest 90 percent of their deer, and demand for deer increases with projected community population growth at 14 percent per decade. The "Project Area Supply" line displays 10 percent of the estimated habitat capability for deer in (1) 1956 before any timber harvest; (2) in 1996; and (3) in 2010 for the "worst case" alternative (Alternative F). The "1997 TLMP Supply" line displays 10 percent (one measure of the harvestable amount) of the current estimated deer habitat capability at years 2010 and 2050.

Figure 4-7 Estimated Deer Availability and Demand in Areas Used by Juneau Residents



SOURCE: Schenck 1996.
NOTE: Data is displayed only for those WAAs that accounted for 90 percent of the total deer harvest for this community (WAAs 2621,2722, 3308, 3309, 3417, 3420, 3523, 3524, 3525, 3526, 3627, 3551, 3627, 3629, 3835, 3836, 3837, 3938, 3939, 4043, 4044, 4055, 4145, 4146, 4147, 4148, 4149, 4150, 4222, 4252.)

Tenakee Springs

Tenakee Springs residents use the Project Area extensively (Appendix F-4C). Between 1990 and 1995, residents harvested 21 percent of their deer from WAAs 3525 and 3526. Habitat capability in all WAAs used by Tenakee Springs are currently estimated to be sufficient to meet subsistence demands, but are not sufficient to meet all demands (see Figure 4-6). All of the action alternatives include harvest units located in areas used by residents of Tenakee Springs for deer hunting.

The area in which Tenakee Springs residents harvest 90 percent of their deer is able to support sufficient deer to meet all current subsistence demands, but is unable to meet non-subsistence demands. All of the action alternatives would reduce habitat capability, but would not have a substantial effect on the supply of deer to meet subsistence demands until 2050. The major change projected is the increase in subsistence and non-subsistence demand (Figure 4-6).

Based on the direct effects described above, there is not a significant possibility of a significant restriction of subsistence use of deer for Tenakee Springs residents due to this project alone. Cumulatively, there is a significant possibility of a significant restriction at some time in the future, due to an ever increasing human population and associated hunting demand and declining deer habitat capability.

Juneau

The number of deer harvested by Juneau sport hunters represents 64 percent of all of the deer harvested in those portions of WAAs 3525 and 3526 within the Project Area. However, this represents only 3 percent of the total deer harvested by Juneau hunters. Habitat capability in these WAAs is currently sufficient to meet Juneau hunter demand, but is not sufficient to meet all demands (Figure 4-7). All of the action alternatives would reduce deer habitat capability. In the future, habitat capability will not be sufficient to meet the increased demand from an ever increasing human population.

Other Resources: Abundance and Distribution

Furbearers

Furbearers (e.g., marten and otter) are presently being trapped in the Project Area. This analysis assumes most of the trappers are from the surrounding rural communities, since trapping on federal lands is restricted to rural residents only. Table 4-23 indicates that furbearer habitat capability under all alternatives would be sufficient to sustain the 1990 to 1995 average harvests.

The effects of improved road access were considered in determining project effects on subsistence resource abundance and distribution. Since current Federal Subsistence regulations prohibit the use of motor vehicles for trapping furbearers on Northeast Chichagof Island, increased road construction would not result in additional vehicle access for furbearer trapping by subsistence users.

When considering only the direct effects of timber harvest and road construction, this project would not likely result in a significant possibility of a significant restriction to subsistence users. This finding is based on the roads not being connected to a major community and not being connected to a ferry route or terminal.

Considering the cumulative effects, however, there is already a restriction on the subsistence use of motor vehicles for trapping furbearers, and this restriction is likely to continue into the future. (See Table 4-24 for a summary of findings regarding significant restrictions of subsistence use.)

Table 4-23
Northeast Chichagof Landscape Area[1]: Average Harvest Levels of Selected Subsistence Species Compared with Habitat Capability

	Deer	Brown Bear	Marten	Otter
Average Harvest per year (1990 to 1995)	910	12	60	6
Population Needed to Support Harvest	9100	300	155	120
Habitat Capability in 1956	8817	407	584	253
Habitat Capability in 1996 (Alt. A)	8000	381	403	210
Habitat Capability by Action Alternative				
B	7938	379	386	209
C	7944	379	387	209
D	7954	379	389	209
E	7956	379	390	209
F	7924	378	383	208

Source: Schenck 1996

[1] The Northeast Chichagof landscape area includes WAAs 3523, 3524, 3525, 3526, 3551, and 3630.1

Brown Bear

Rural residents within Game Management Unit 4 (Admiralty, Baranof, and Chichagof Islands) and the residents of Kake are allowed to harvest brown bear for subsistence purposes under Federal subsistence regulations. Others may harvest bear under the general provisions of the State. Brown bear are generally not considered a food source, but rather a very limited use is made of parts of the bear for cultural purposes. Most bears taken in the Project Area are harvested by sport hunters (Faro 1996, personal communication).

Table 4-23 displays the brown bear harvest from Northeast Chichagof Island (which includes the Project Area) from 1990 to 1995. The table indicates that brown bear abundance under all alternatives would be sufficient to sustain the average annual harvest. An average of 12 brown bears, or approximately 3 percent of the existing habitat capability, was harvested per year between 1990 and 1995. The sustainable harvest level for brown bears is variable depending on the suitability of habitat conditions, but is generally considered to be 4 percent (Schenck, 1996).

State and Federal Subsistence regulations currently prohibit the use of motor vehicles for hunting bears on Northeast Chichagof Island. This restriction is likely to continue into the foreseeable future. With the regulations that are currently in place, increased road construction would not result in additional vehicle access for bear hunting by subsistence users.

When considering only the direct effects of timber harvest and road construction, this project would not likely result in a significant possibility of a significant restriction to subsistence users of brown bear. However, when considering the cumulative effects of past timber harvest and road construction, current activities outside the project area, and reasonably foreseeable activities, there is a significant possibility for a significant restriction. (See Table 4-24.)

Marine Mammals

Federal law prohibits the taking of marine mammals by anyone other than Native hunters. There is no evidence that timber harvest activities have had any effects on marine mammals taken for subsistence, nor on their habitat. There are no foreseeable impacts from the proposed actions on marine mammals.

Salmon

Salmon are a major subsistence food harvested in the Indian River Project Area. The Fisheries section of this chapter concludes that no quantifiable effects are expected on salmon and trout spawning and rearing habitat. All salmon spawning and rearing streams (Class I and Class II streams) near proposed harvest units are protected by buffers of at least 100 feet as prescribed in the TTRA. In addition, specific prescriptions for protecting salmon habitat were incorporated, if needed, during the design of harvest units and roads (see Appendices I and J for road and unit cards). By implementing these site-specific protection measures, any immediate or foreseeable effects on the abundance and distribution of salmon for subsistence uses in the Project Area would not be measurable.

Shellfish

The Transportation System section of Chapter 4 indicates that less than 1 percent of the Project Area estuarine habitat would be affected by LTF construction under any of the alternatives. LTF sites are proposed at Sunny Cove, Sunny Too, and 10-Mile Creek. In general, operation of LTFs result in small effects to benthic organisms. Sunny Cove and Sunny Too are near subsistence crabbing sites. The proposed LTF sites would deposit bark on marine and estuarine habitat, potentially changing habitat for crabs and benthic organisms. The effect of the LTF sites on the abundance and distribution of local crabs, clams, and other shellfish would not be measurable for purposes of subsistence. The project effects for the foreseeable future would not be significant.

Other Finfish

The action alternatives for the proposed project would have no immediate or foreseeable effect on other finfish habitat. Because there would be no effect on their habitat, the abundance and distribution of these species would not be affected.

Other Subsistence Food Resources

Other foods include plants such as kelp, goose tongue, and a variety of berries. Most gathering of such traditional food occurs near beach and estuarine areas. Road construction activities may improve access to berry picking sites that are not now reasonably accessible. Since the proposed timber harvest would not significantly impact beach fringe and estuaries, and since additional food gathering sites would be made available, the abundance and distribution of other foods are not expected to be substantially affected by the project or by cumulative effects of this and other reasonably foreseeable projects.

Firewood

The Forest Service has a free-use policy for firewood and timber. None of the proposed alternatives would have an adverse effect on the availability of firewood and personal-use timber. Construction of low-angle slides at the LTFs could make personal-use timber more accessible to individuals.

Competition

Increased competition for subsistence resources could occur temporarily from logging camp residents. Timber harvest has occurred in the Project Area in the past, and local residents reported the perception of displacement and crowding due to the presence of logging camp residents. The roads brought better access into newly roaded areas and local hunters began to compete more with each other and hunters from elsewhere in the Project Area.

Competition by non-rural hunters is a concern because non-rural residents harvest the majority of deer from the Project Area (see the Subsistence section in Chapter 3). Section 804 of ANILCA gives the Federal Subsistence Board the authority to regulate non-rural harvest of deer, and to prioritize the harvest of deer among rural residents when necessary to protect the resource. The current deer population level does not necessarily require restrictions on non-rural users. However, the Federal Subsistence Board did restrict hunting by non-rural hunters in GMU 4 in regulatory years 1991 and 1992.

There is no evidence to indicate that salmon, finfish, shellfish, or other food resource availability to subsistence users would be affected by non-rural harvest. Any increase in competition from non-rural residents and Alaska non-residents would not be substantial because of the availability of resources in the immediate vicinity and in the surrounding areas.

Individual household use of specific areas may be displaced by some of the action alternatives. There is not sufficient information available nor would it be practical to evaluate displacement potential for individual households. The Project Area's remoteness makes it very unlikely that an individual household or even an entire community is highly dependent on specific areas within the Project Area that may be impacted by timber harvest or road construction activities. Generally, there are sufficient lands available elsewhere within or outside the Project Area for subsistence gathering. Any displacement that may occur is likely to be to other areas within a household's or community's historical range. Furthermore, any displacement that may occur would likely be temporary until timber management activities within the Project Area conclude in 3 to 5 years.

Access

Access to subsistence-use areas may be affected where short term logging activities (such as LTFs) are located in the beach fringe. Less than 1 percent of the beach fringe and estuary fringe habitat would be modified by proposed roads and units.

Access to interior hunting sites could be improved by the construction of new and reconstructed roads. Residents from nearby communities, especially Tenakee Springs and Juneau, are expected to utilize the roads for hunting either on foot or with motorized vehicles transported to the site. (See subsections on furbearers and brown bears for discussion of access restrictions. See the Transportation section for more information on proposed roads.)

Road Management Objectives (RMOs) developed for Project Area roads take subsistence uses into consideration (see Appendix D). These access prescriptions can be changed if the need arises to manage wildlife resources differently for subsistence users.

Cumulative Effects

The cumulative effects evaluation of subsistence resources determines whether or not past, present, and reasonably foreseeable future activities may restrict subsistence uses. It also identifies the rural communities that use the Project Area that would be most affected by a restriction. Table 4-24 displays a summary of restrictions to subsistence uses that may be due to project effects and cumulative effects.

Abundance and Distribution

Timber management activities such as harvesting timber and building roads affect wildlife capability (see Table 4-23). This, in turn, could affect the abundance and distribution of subsistence resources. The abundance of brown bears, furbearers, fish, and other subsistence resources appear to be sufficient to meet subsistence needs from the Project Area now and in the future. Average subsistence deer harvest in the Northeast Chichagof landscape area exceeds 10 percent of the 1956 and existing habitat capability, indicating that demand for deer exceeds the supply. (The Northeast Chichagof landscape area includes WAAs 3523, 3524, 3525, 3526, 3551, and 3630.1.) Future reductions in habitat capability may intensify conflict between subsistence harvest and sport harvest of deer in the Project Area, resulting in restrictions to sport hunters first and, if necessary, subsistence hunters. To be successful, hunters may need to make changes from their past hunting techniques, numbers of hunts, or times of hunts. They may have to travel to locations further from traditional hunting locales.

Other long-term effects of timber harvest that change habitat conditions for wildlife occur 25-30 years after harvest. At that time, the stand canopy begins to close and the understory begins to produce less forage (see Figure 3-3). Understory forage species are virtually eliminated for 100 years or more before they are re-established. Forage availability would decrease to near zero by year 50 following clearcut harvest (Schenck, 1996). Forage production in the new clearcut may be unavailable in winter due to a decrease in snow interception by the overstory and increased snow accumulations. The deeper snow stresses deer by increasing their energy needs during a time when they have high nutritional needs and foraging is difficult. The deer habitat capability models used in the analysis of alternatives account for this reduction in habitat suitability (see Figures 4-2 through 4-7). In addition, Appendix F includes two tables that display Project Area acres of stem exclusion and percentage of second growth habitat in stem exclusion 25-140 years after harvest.

Competition

Cumulatively, there are no known changes in competition from non-subsistence users in the foreseeable future in the Project Area or the Northeast Chichagof Island landscape area.

Access

Considering the cumulative effects of timber harvest and the effects of road access, there is currently a restriction on subsistence users on methods of access for trapping of marten, mink, and weasels on Federal lands, and a restriction on the use of motor vehicles for hunting of brown bears. Current Federal Subsistence and ADF&G regulations prohibit the use of motorized vehicles for hunting brown bears or trapping furbearers on Northeast Chichagof Island. These restrictions apply to subsistence and other users and are likely to continue into the future. With the current regulations in place, increased road construction from any of the action alternatives would not result in additional vehicle access for brown bear hunting or marten trapping by subsistence or other users.

Table 4-24
Summary: Significant Possibility of a Significant Restriction of Subsistence Use

Effects	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
Abundance or Distribution	Project	(Cum.)	Project	(Cum.)	Project	(Cum.)	Project	(Cum.)	Project	(Cum.)	Project	(Cum.)
Deer	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)
Brown Bear	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Furbearers	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Fish Resources	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Other Resources	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Competition												
Deer	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Brown Bear	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Furbearers	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Fish Resources	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Other Resources	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Access												
Deer	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Brown Bear	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)
Furbearers	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)	No	(Yes)
Fish Resources	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)
Other Resources	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)	No	(No)

Source: Schenck 1996
Note: "No" indicates an insignificant possibility of a significant effect. "Yes" indicates a significant possibility of a significant effect.

Resource Findings

The above analysis leads to the conclusion that the Project effects do not present a significant possibility of a significant restriction on subsistence use of deer, brown bear, furbearers, marine mammals, waterfowl, salmon, other finfish, shellfish, and other foods in the Northeast Chichagof Landscape. (See Table 4-24.) This finding is based on the potential resource effects by the three evaluation categories: abundance and distribution, competition, and access. However, when the Project effects are considered along with past, present and reasonably foreseeable future projects, there is a significant possibility of a significant restriction in the subsistence uses of deer, furbearers, and brown bear. A restriction on subsistence use of motor vehicles for hunting brown bear and trapping furbearers is currently in place.

The direct effects of this project on the subsistence use of deer, considered in the context of total habitat capability in the WAAs, appear insignificant. However, based on cumulative effects of further reducing habitat capability in the WAAs where demand exceeds supply and on the possibility that indirect competition may worsen the supply and demand situation in some other WAAs, there is a significant possibility of a significant restriction for Hoonah and Tenakee Springs residents, regardless of which alternative is implemented.

It seems clear that restrictions on subsistence use of deer would result from recurring severe winter weather. The likelihood of a subsistence use restriction is about a one in eleven chance. This is based on an analysis of historical weather records which indicated an eleven year weather cycle (Juday, 1984; Merriam, 1970), in which deer populations dropped due to severe winter weather (Johnson, 1986). Therefore, statistically, there is a 100 percent chance that one in eleven years there will be a severe winter in which the deer populations will decline. This generally occurs when the snow depth and cold drive the deer to the beaches in search of food. When the deer populations decline due to weather,

season lengths and bag limits are reduced, total deer hunting effort is likely to drop, and total harvest is likely to be reduced. There will be a significant possibility of a significant restriction under these circumstances.

Likely reductions in subsistence uses due to the cumulative effects of this and other projects include: reductions in season lengths, reduced bag limits, increased travel distances to hunting areas, and increased effort required to bag less abundant game

If subsistence resource populations such as deer, bear or marten are reduced to the point where a lack of harvest curtailment would result in a health-of-the-population concern, subsistence user restrictions would be implemented. Reductions would be based on the best available data, and follow accepted conservation practices. The restrictions would likely be relatively short-term (two to three hunting or trapping seasons).

Typical adjustments in season and bag limits for deer in Game Management Unit 4 have been as high as a 50 percent bag limit reduction (from 6 to 3 deer) and up to a 33 percent reduction in season length (6 months to 4 months), depending on the severity of winter weather. Restrictions to non-subsistence users have also occurred at these times. Restrictions have lasted from 2 to 5 years, depending on the amount of winter deer mortality, the severity of subsequent winters, and other factors affecting the recovery of the deer population.

Determinations

Section 810 (a) (3) of ANILCA requires that when a significant restriction may occur, determinations must be made in regard to whether:

- such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of public lands;
- the proposed activity would involve the minimum amount of public lands necessary to accomplish the purposes of such use and occupancy, or other disposition; and
- reasonable steps would be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions.

Necessary, Consistent with Sound Management of Public Lands

The alternatives have been examined to determine if they are necessary, consistent with sound management of public lands. This examination has considered the following: the National Forest Management Act of 1976, ANILCA, Alaska Regional Guide, 1997 TLMP, Alaska State Forest Practices Act, and the Alaska Coastal Zone Management Program.

ANILCA emphasized the maintenance of subsistence resources and lifestyles. However, ANILCA also required the Forest Service to make available for harvest 4.5 billion board feet of timber per decade from the Tongass National Forest. The Tongass Timber Reform Act (TTRA) removed the 4.5 mmbf requirement from ANILCA but directed the Forest Service to seek to meet market demand and the market demand for the planning cycle. Demand for timber from the Tongass National Forest is expected to remain high (USDA Forest Service 1995b).

The action alternatives presented here encompass five different approaches that would produce the resources that would best meet the needs of the public and help achieve multiple use management objectives in the 1997 TLMP. All of the alternatives involve some potential to impact subsistence uses. There is no alternative that would meet 1997 TLMP objectives and yet avoid a significant possibility of subsistence restrictions somewhere in the Forest. Therefore, based on the analysis of the information presented in this document on the proposed alternatives, these actions are necessary and consistent with the sound management of public lands.

Amount of Public Land Necessary to Accomplish the Purpose of the Proposed Action

Much of the Tongass National Forest is used by one or more rural communities for subsistence purposes for deer hunting. The areas of most subsistence use are the areas adjacent to existing road systems, the beaches, and the areas in close proximity to communities. The extent and location of the subsistence use area within the Project Area make complete avoidance impossible. Areas other than subsistence use areas that could be harvested may be limited by other resource concerns such as: soil and water protection, high value wildlife habitat, economics, or scenic quality.

Effort was taken to protect the highest value subsistence areas. For example, beach fringe is one of the highest use subsistence areas. Less than one percent of the beach fringe habitat would be changed by proposed roads. A viable timber harvest project always includes alteration of old-growth habitat. This, in turn, always reduces projected habitat capability for old-growth-dependent subsistence species. It is not possible to reduce harvest in one area and concentrate it in another without impacting one or more rural communities' important subsistence use areas. In addition, harvestable populations of game species could not be maintained in a natural distribution across the forest if harvest were concentrated in specific areas. A well-distributed population of species is also required by the Forest Service regulations implementing the National Forest Management Act (NMFA).

Reasonable Steps to Minimize Adverse Impacts Upon Subsistence Uses and Resources

Reasonable steps to minimize impacts on subsistence have been incorporated in development of the alternatives and project design criteria. The Federal Subsistence Board may use its authority to prioritize the harvest of resources among rural residents when necessary to protect the resource. This type of action, as prescribed by ANILCA, Section 804, may be necessary to ensure the availability and adequate abundance of deer and marten needed by the rural communities using the Project Area.

The Record of Decision (ROD) for the Indian River Timber Sale(s) Final EIS will include a final determination about the possibility of significant restrictions on subsistence resource uses that may result from implementing the selected alternative. Below is a summary of the Draft EIS (DEIS) evaluation and findings.

Hearings

On the basis of findings of this analysis and under the provisions of the Alaska National Interest Lands Conservation Act, subsistence hearing(s) will be held on the dates, times, and at the places announced in the letter accompanying this DEIS. Letters are being sent to the Federal Subsistence Board, Alaska Department of Fish and Game, Regional Fish and Game Advisory Councils, local Fish and Game Advisory Committees, and to the City of Tenakee Springs. Announcements will be made in newspapers and posted in public areas. Testimony at the hearings can be either verbal or written. People unable to attend are encouraged to have another person submit their written testimony at the hearing. If they prefer, people can send written testimony to the Indian River Planning Team, as long as it is postmarked on or before the date of the hearing in the community to which it refers. Testimony received, both verbal and written, will be incorporated into the FEIS.

Recreation

Direct, Indirect and Cumulative Effects

This section analyzes the effects of the proposed timber sale(s) on the recreation attractors and activities on both non-National Forest and National Forest System lands. The effects of the alternatives on the recreation resource are considered from two aspects or phases: (1) during the sale itself, and (2) after the harvesting has been completed.

Recreation Resources

Recreation Opportunity Spectrum (ROS)

Recreation experiences on National Forest System lands change as management prescriptions are implemented. The comparison of alternatives in Table 4-25 shows how the timber sale(s) would affect the Recreation Opportunity Spectrum (ROS) experience in the Project Area. In all cases, the area would change from a more wild experience to a more developed one. Alternative D would have the least impact on the existing recreation experience, with a 26 percent acreage change in Semi-Primitive Non-Motorized (SPNM) and 1 percent change in Semi-Primitive Motorized (SPM). The Roaded-Modified (RM) recreation opportunity experience would increase from 20 percent to 48 percent. Alternative F would have the most effect on the existing recreation experience. (See Recreation maps in Appendix G.)

Table 4-25
Recreational Opportunity Spectrum Alternative Comparison by Acres and Percentages of National Forest Land in the Project Area

	Alt. A (Existing)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
SPNM	28,319 79%	17,611 49%	17,862 50%	18,790 53%	18,219 51%	16,540 46%
SPM	392 1%	143 0%	357 1%	143 0%	357 1%	250 1%
RM	7,012 20%	17,969 51%	17,504 49%	16,790 47%	17,147 48%	18,933 53%
Total	35,723 100%	35,723 100%	35,723 100%	35,723 100%	35,723 100%	35,723 100%

Source: Nelson 1996

The long-term effects on ROS would also differ by alternative. For example, Alternative B would recover its wildland appearance sooner, even though the impacts of this alternative cover more of the Project Area than the other action alternatives. This is a result of the higher percentage of partial harvest units in Alternative B, which means less impact to the recreation experience in the long-term.

Shoreline Recreation Opportunities

Most of the existing recreation experience on the saltwater shoreline on National Forest land is RM (7 miles), with a small amount of SPM (2 miles). The RM areas would be extended in Alternatives B and D, with the development of an LTF site at 10-Mile Creek. In all other alternatives, the shoreline recreation opportunities would remain the same. The non-National Forest System shoreline would only be altered in Sunny Cove. A LTF would be built on the former Sunny Cove LTF site in Alternatives B, C, and E. In Alternative F, a new LTF site (Sunny Too) would be developed in Sunny Cove. (See the Transportation System section in this chapter.)

Alternative D would have the smallest impact on the recreation use of the Sunny Cove shoreline, because the LTF site would only be used for mobilization (unloading heavy equipment from barges). In this alternative, harvested timber volume would be transfered from the area via the LTF at 10-Mile Creek.

Of the alternatives that use a LTF in Sunny Cove, Alternative B has the smallest harvest volume and would also use the 10-Mile Creek LTF. This would limit the disruption of recreational use of Sunny Cove. Alternative F would have the highest impact to the non-National Forest shoreline. This alternative harvests the largest amount of timber volume, and the new Sunny Too LTF would have a much larger visual impact than the former LTF, extending 200 feet into the cove and at least ten feet higher than mean-high tide.

Sense of Isolation (Visuals and Noise)

One aspect of the Alaskan experience enjoyed by local residents, recreationists, and tourists is a sense of isolation caused by the absence of sights and sounds related to human use (for example, the sight of harvested landscapes). In this project, the recreation vegetation visual attractors that would be altered by human use to the highest degree are the Sitka spruce, western hemlock and Alaska yellowcedar stands. Alternative E would have the least impact (4 percent). Alternative F would have the greatest impact (6 percent) in the Project Area. In all action alternatives, a wildlands experience is not achievable in the immediate area of LTFs, but the effect would only last for five to seven years. Alternatives C, D, E, and F would have the least impact, since these alternatives propose using only one LTF. Alternative B proposes to use two, which doubles the area affected.

Noise would result from activities at the LTF sites and from helicopter operations, but would only occur during the periods the timber sales are active. Harvest activities would span three to five years, with the normal operating season from March to November each year.

The noise and activity at the LTF sites in Sunny Cove may cause a decrease in the tourist economy in Tenakee Springs. Activities would be visible not only from a distance (1/2 mile offshore), but also close-up from the East Tenakee Trail. To the extent that tourists avoid Tenakee Springs because of this activity, the tourist economy would decline. The effect would be for the life of the sale(s) and rehabilitation of the LTF (approximately five to seven years). Alternative D would have the least impact because it does not propose a LTF in Sunny Cove. However, off-loading road building equipment at the site under this alternative would still have a short-term impact on the opportunity for a wildland experience. Of the alternatives utilizing the Sunny Cove LTF site, Alternative B would have the least impact due to the small amount of harvest volume removed through the site. Alternative F would have the most impact because it proposes the most volume to be transferred at Sunny Cove.

In all action alternatives, the direct effect of noise on Tenakee Springs would probably be minimal. A ridge system lies between the town and the main part of the Project Area where timber harvest activities would occur. Harvest activities in Alternative D are at least eight miles from Tenakee Springs. Under the other alternatives, harvest activities are at least three to six miles away.

Helicopters would be used during the project for harvesting timber and for transporting personnel. They would likely be stored and maintained at Corner Bay. Two daily, low altitude flights across Tenakee Inlet for each helicopter would be required. The Tidelands Memorandum of Understanding (MOU) between the Forest Service and the City of Tenakee Springs stipulates that helicopters would only be allowed a certain flight path in the timber sale area except in case of emergency (see Mitigation Measures in Appendix C).

This provision would not control the amount of noise made by the helicopters, but would contfine the noise to certain areas. The provision is directly linked to Tenakee Springs' concern about noise pollution throughout the immediate area surrounding the Project Area.

The same type of effects at Sunny Cove would happen at the 10-Mile Creek LTF site in Alternatives B and D. Though some hiking is done at 10-Mile Creek, the area is viewed from the saltwater by people traveling with outfitters and guides, independent boaters, and small cruise ships. Alternative B would have less effect than Alternative D, because less volume is transferred at 10-Mile Creek. Alternatives C, E, or F do not use this LTF site.

Saltwater and Freshwater Fishing

No reduction of saltwater fishing is expected due to habitat loss. However, LTFs in Sunny Cove and 10-Mile Creek would cause a temporary displacement of saltwater recreation fishers (halibut, rockfish, salmon, snapper, crab, and shrimp). Displacement would be caused by log rafting and transporting activities, which would last three to five years.

At Sunny Cove, Alternative B would have the least impact because it has a lower timber volume than the other alternatives. However, it would have the most detrimental effects on saltwater fishing overall, because it proposes the use of both 10-Mile Creek and Sunny Cove LTFs, causing more displacement. Alternative F would have the highest impact because with a higher timber volume it would take longer to harvest.

At 10-Mile Creek, Alternative B has the lowest impact to the saltwater area surrounding the LTF because it has the least amount of timber volume being transferred at the site. Alternative D would have the most impact because it has a higher amount of volume than B and would be used for a longer period of time.

Indian River has the highest amount of freshwater fishing within the Project Area. Most of the fishing occurs below the waterfall system. No alternative would affect this specific area. With the Riparian Management Area prescriptions in the 1997 TLMP, it is not anticipated that there would be any degradation to the aquatic resource. (For further details, see the Soils, Fish and Water sections in this chapter.)

Deer Hunting

No reduction in sport deer bag limits or seasons is expected as a result of Indian River Project timber management activities. The possibility of a reduction exists if the area experiences severe winter conditions with or without this project. (For further details, see the Wildlife and Subsistence sections.)

Tenakee Springs residents annually harvest approximately 69 deer, and expressed a concern about deer hunting competition from logging camp employees. Since the camps would likely be located away from the Project Area (at Corner Bay in Alternatives B, C, E, and F, and at Seal Bay in Alternative D), this would alleviate the residents' concerns in the immediate area of the community.

Deer hunting competition in Corner Bay (WAA 3627) and Seal Bay (WAA 3629) was also considered, since Tenakee Springs hunters take 29% of their total annual deer harvest from these two WAAs. WAA 3627 includes Corner Bay, Trap Bay, and the shoreline north of Little Basket Bay. Average annual harvest in this WAA is 82 deer. On average, five of these deer are taken by Tenakee Springs residents. WAA 3629 includes Long Bay, Seal Bay, Saltery Bay, and Crab Bay. Average annual harvest in this WAA is 205 deer. On average, 15 of these deer are taken by Tenakee Springs residents. This represents 22 percent of the residents' annual deer harvest.

The people in Tenakee Springs would probably feel the highest impact of competition for deer hunting in this area in Alternative D, in which the logging camp would likely be located at Seal Bay. Alternative B would have the least amount of impact on the competition for hunting (proposed logging camp at Corner Bay) because it has the smallest amount of volume to be harvested, so the camp would close sooner than in Alternatives C, E, and F.

The largest impact by logging camp employees' hunting competition would be felt by the Juneau hunters who harvest an average of 67 percent (55 deer) and 59 percent (121 deer) of the deer from WAA 3627 and WAA 3629, respectively. This competition could cause a decline in the number of Juneau hunters who stay in Tenakee Springs while hunting. This, in turn, could cause a decline in Tenakee Springs recreation/tourism income from the Juneau hunters.

November is the highest use month for Juneau hunters in the Tenakee area. Some of these hunters utilize the Indian River road system. In Alternatives B, C, E, and F, harvesting and log haul on the Indian River road would continue until the end of November, and the road may not be available for personal use. Tourist income generated from the hunters' use of the area would possibly decrease in these alternatives.

The limiting of hunter access to the Indian River road system by the contractor for safety concerns may cause a decrease in deer harvesting in the Project Area. Alternative D would have the least impact on hunters because there will be very little harvesting in the Indian River drainage and the 10-Mile LTF will be used to transport the timber. Alternative F would have the largest impact because of the high volume harvest and the added time to transport it on the Indian River road.

East Tenakee Trail

Regardless of the LTF site used in Sunny Cove (Alternatives B, C, E, and F), noise generated from either site could disturb people expecting a wildland experience on the East Tenakee Trail and the Indian River bear-viewing area. Noise would be from generators and truck traffic for the duration of the sale (March through November, 3 to 5 years).

Alternative B would have the least impact because it has the smallest amount of volume to be transported to the Sunny Cove LTF. Alternative F would have the greatest impact because it has the highest volume to be removed through this LTF.

However, other recreation opportunities exist in the area, such as the West Tenakee Trail, that could be substituted for the use of the East Tenakee Trail. The Indian River bear-viewing opportunity could not easily be duplicated. This use would probably continue but at a lower level. The bear-viewing area is 0.25 to 0.5 mile from the LTF sites, and the noise increase would be considered moderate compared to the existing situation. Forest Service wildlife biologists feel that the bears would adjust to the noise and continue to feed at the river's falls area.

To keep the trail usable during the harvesting, an access ramp from the existing trail on to the Indian River road prism would be needed, plus a four-foot-wide walkway for 80 feet on the road prism and an exit ramp back onto the trail. The section of trail on the road prism would be constructed through the existing alder growth. A screen of alder would be left between the road and the trail. Gravel would be used to cover the alder staubs on the trail and provide safe footing. A survey and construction plan would be completed by Forest Service personnel for inclusion in the timber sale contract.

In all action alternatives, safety measures for people crossing the road would be provided by construction of ramps for entering and exiting the road prism. Trail construction and access would be part of the timber sale contract and would follow Forest Service trail standards and specifications.

In all action alternatives, trail use could be disrupted during reconstruction. Alternative D would have the least impact on the trail users. Under this alternative, this portion of road would no longer be used once the heavy equipment has passed through the area. Alternative F would have the largest impact because the trail would be moved and modified to accommodate construction of the Sunny Too LTF.

In all action alternatives, the contractor would be required to maintain clear access to the East Tenakee Trail during sale operations. After harvesting has been completed, any damage to the trail would be corrected to Forest Service trail standards by the contractor. These provisions would be included as a clause in the timber sale contract(s) (Nelson 1996).

Indian River Road System

The main Indian River Drainage is the highest use area for the residents of Tenakee Springs. The recreation opportunities enjoyed on the Indian River road system (including the 10-Mile and Freshwater drainages) could be affected by the noise of vehicle traffic and harvesting. The noise would be prominent throughout the valleys for three to five years. Alternative D would have the least amount of harvesting and road building in this drainage, so it would have the smallest noise impact. Alternative F would have the greatest noise impact on this area for three reasons: 1) it has the largest amount of harvesting in the drainage; 2) it has the largest amount of timber volume in the total Project Area; and 3) all of this volume would be transported through the Indian River drainage to the Sunny Too LTF.

Recreationists' access to opportunities which utilize the LTF areas and Indian River road may be limited by the contractor's concern for operational safety. Alternative D would have the least impact on limited use of the area, since the contractor would only use Sunny Cove for off-loading equipment. All of the other action alternatives propose a LTF at Sunny Cove.

During this entry, Alternative F would have the most acreage visually disturbed in the Project Area by timber harvesting and road building, and Alternative E would have the least. Alternative D would visually disturb the immediate Indian River drainage the least.

Karst Recreation

The Geology section states that no degradation to the karst resource would occur during or after the harvesting and road building for the proposed timber sale. However, the resource accessed by the Indian River road system will probably be curtailed by the logging operator because of safety concerns for three to five years. After the harvesting has been completed, the karst resource would again be available for recreation use.

Tenakee Springs Use Areas

Effects within Tenakee Springs' home range would occur in all action alternatives during the sale. This is due, in part, to the fact that all or most of the Indian River road system may not be available for recreation use. (See Indian River road system discussion above.) This would also be true with the LTF sites at 10-Mile Creek and Sunny Cove. Alternative D would have the least impact on the home range of Tenakee Springs because Sunny Cove

and the main Indian River road would not be used for harvesting, making them available for recreation use.

Table 3-32 displays recreation uses by Tenakee Springs residents and tourists in the Project Area. All of these activities would be disrupted to some extent during harvesting. Alternative D would have the least impact, because of the timber purchaser's limited use of Sunny Cove and the Indian River road. Alternative F would have the most impact because it harvests the highest timber volume, and would use the Sunny Too LTF. After the harvesting, the recreation users' experience of the existing activities would be at a higher level of development because of the altered landscape.

Recreation Places, Activities, and Site Alternative Comparison

Recreation Places

The degree of change to existing Recreation Places depends upon how the new road system would be managed or how harvesting has affected it. Table 4-26 shows the effects on existing Recreation Places by changes in the recreation experience (ROS), and changes in the acreage of each Place effected by Road Management Objectives (RMO) for each alternative (see Appendix D).

Table 4-26
Recreational Places: Changes to the ROS Settings and Acres Due to Proposed Road Management Objectives, by Alternative

Recreation Place	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Indian River Road System (#31,120.01)						
ROS Setting	RM	RM	RM	RM	RM	RM
Acres	3,417	4,510	4,514	662[2]	662[2]	662[2]
10 Mile Estuary (#31,156.01)						
ROS Setting	SPM	RM	SPM	RM	SPM	SPM
Acres	128	0[1]	128	214[3]	128	128

(1) - 10-Mile Recreation Places would become part of the Indian River Road System Recreation Place due to roading and the development of the 10-Mile Creek LTF. The ROS recreation experience would change from SPM to RM. The proposed RMO would keep all the main line roads open for recreation vehicular use, thereby increasing the size of the existing Recreation Place.

(2) - The Indian River Road System proposed RMO for this alternative would close this road system to recreation vehicular traffic. This action would cause the Indian River Recreation Place to shrink in size to an area that would be accessible to hike to and from Tenakee Springs in one day.

(3) - The 10-Mile Recreation Place recreation experience would change from SPM to RM in this alternative. The proposed RMO for this area would close the road to vehicular use. The Recreation Place would increase in size slightly because people use the developed LTF sites for access into areas.

Source: Nelson 1996

In Alternatives D, E and F, the Indian River Road System Recreation Place would be reduced by 81 percent, due to proposed RMOs that would not maintain the road for recreation vehicular traffic.

The Sunny Cove LTFs are in the Indian River Recreation Place. In Alternatives B, C, E, and F, there are no harvest units near the LTFs, and so recovery time for the recreation experience is expected to be comparatively short. After the sale and rehabilitation of the LTFs, the recreation opportunity would remain RM until the area has the qualities to provide a Roaded Natural (RN) experience (approximately five years). After ten years, it would be Semi-primitive Motorized (SPM).

The Indian River Road is also in the Indian River Recreation Place. After the harvesting has been completed, the recreation opportunities would remain RM. If Alternative D is selected, the Indian River drainage road system would revert to a RN or SPM area sooner than the rest of the Project Area, because there would be no harvesting in the drainage. This would enhance the Indian River Recreation Place even more for those wishing to have a wildlands experience.

The 10-Mile Recreation Place experience would be changed from SPM to RM in Alternatives B and D. For recreationists who enjoy the existing condition, this would be a negative impact. However, the proposed RMO for Alternative B would also add the 10-Mile Creek LTF development into the large, maintained Indian River Road System Recreation Place.

Recreation Activities

The Recreation Activities would not change in any alternative, but the wildness of the experience would be changed from SPM to RM in Alternatives B and D in the 10-Mile Estuary Recreation Place.

Recreation Sites

The existing Recreation Sites (Sunny Cove anchorage, the beaver ponds area, 10-Mile's dispersed camp sites, a cave, and a trail leading to alpine on the Freshwater/10-Mile Pass) would not be disturbed in any alternative. However, depending upon the proposed RMO, access to some sites could be impeded. In Alternatives D, E and F, the proposed RMO would not maintain the road system for recreation vehicles. The sites affected would be the cave and the trail.

Roadless Areas

All of the action alternatives would reduce the size of the two inventoried Roadless Areas (#321 Tenakee Ridge, and #323 Game Creek) in the Project Area, but they would still meet the 5,000 acre size criteria qualifying them for possible consideration for a Wilderness designation. In Alternatives B, D, and F, not only is the Game Creek Roadless Area reduced in size, it will be split by the harvesting and roading at the 10-Mile drainage. The resulting two new unroaded areas would still be over 5,000 acres in size, making it possible for each piece to be considered for a Wilderness designation in future land management plans.

Recreation Commercial Uses

Tenakee Springs

The disturbance of the wildlands visual resource and existing noise level in Sunny Cove may affect the number of Tenakee Springs' recreation clients during the timber harvesting. Many of these tourists are from Juneau, traveling to the area for a weekend. Alternative D would have the least impact to the visual resource because the Indian River drainage would not be harvested except for one unit. Alternative B would spread the harvest throughout the drainage but use many different types of silvicultural prescriptions, and Alternative C would result in clearcut units (with retention) in the upper portions of the Indian River drainage. Alternative F would have the highest impact because it has the highest clearcut (with retention) volume. The noise disturbance is expected to last three to five years, and these people may not return to the area for this whole period. They may also influence new people by not recommending Tenakee Springs as a place to visit because of the noise and visual disturbance.

Though noise would be increased throughout the area, certain specific sites would have a greater noise increase than others. These sites would be the LTFs, the Indian River road system, log landings, and helicopter fuel sites.

The possibility of a decrease in the tourist trade (and resultant decrease in revenues to the community and outfitters) caused by the change to the visual resource around the 10-Mile Creek LTF is doubtful. The disturbance would be small (operating machinery in a fairly small area), and would occur at a distance (1/2 mile offshore from the LTFs). Alternative C would have the least impact because the 10-Mile Creek LTF would not be used.

During the harvesting, a decrease of tourist dollars could also be caused by competition for the Indian River road system between recreation users and logging operators. This scenario is especially likely in the immediate Indian River drainage, which receives the highest recreation use of the whole road system. Alternative D would have the least impact because the contractor would only have a need for the road system for a short period of time. Alternative F would have the most impact because the contractor would use the road for the longest period of time.

Outfitters and Guides

Logging activity at the Sunny Cove and 10-Mile Creek LTF sites could displace private fishing guides from the saltwater associated with these sites for three to five years.

In all action alternatives, the noise of timber sale activities could decrease the ability of Tenakee Springs businesses and independent guides to provide a wildlands experience for tourists within the Project Area. This decrease would occur between March and November and would last for three to five years.

Though there were 13 outfitters and guides permitted to use the National Forest System lands in the Project Area in 1995, none did. They did use Tenakee Inlet, which views the Project Area from the saltwater and across the inlet. The LTFs would be visible in all action alternatives.

Other Commercial Uses

It is doubtful there would be a change in use by any of the other groups using Tenakee Inlet.

Recreation and Tourism Income

Recreation and tourism income in the community of Tenakee Springs would likely be unchanged under Alternative D. This alternative only harvests one unit in the Indian River drainage, eight miles from the former Sunny Cover LTF. Timber harvested in this alternative would be transported to the 10-Mile Creek LTF.

A possible decline in recreation/tourism income is likely in all other action alternatives. The decline would be caused by the visual and noise disturbances in the Sunny Cove Area and the possible lack of access to the Indian River Road during hunting season. Table 4-27 shows a summary of recreation/tourism income declines.

Table 4-27
Commercial Recreation/Tourism Use and Income Summary For Alternatives B, C, E and F* During and After the Indian River Timber Sale(s)

	Tenakee Springs: Existing	Tenakee Springs: During Harvest	Tenakee Inlet: Existing	Total Existing	Total During and After Harvest
Average Number of People Willing to Pay for Recreation/Tourism Experience	1,226/yr.	1,006/yr. 18% Decrease	752/yr.	1,978/yr.	1,758/yr. 11% Decrease
Average Days of Use by Groups Generating Recreation/Tourism Income	1,248/yr.	1,028/yr. 18% Decrease	74/yr.	1,322/yr.	1,102/yr. 17% Decrease
Average Total Recreation/Tourism Income Generated	$562,300/yr.	$549,432/yr. 2% Decrease	$176,950/yr.	$739,250/yr.	$726,382/yr. 2% Decrease

Source: Nelson 1997
* Commercial recreation/tourism use and income for Alternatives A & D would be the same as the existing situation.

After the sale has been completed, the noise disturbance would not exist and access to the Indian River Road would no longer be encumbered. The recreation/tourism income would remain at the pre-sale level in Alternative D, because there would have been very little disturbance in the Indian River drainage. It is also likely that recreation/tourism income would return to the pre-sale level in Alternative C, because the land disturbance caused by harvesting is located six miles from the former Sunny Cove LTF, and the higher recreation use areas are between the LTF and the timber harvest area. Alternative B harvests units throughout the entire area, but impacts are reduced by emphasizing partial harvest methods. This also means that the area would recover faster for a more wildland recreation experience, causing the recreation/tourism income to return to pre-sale levels more rapidly than in Alternatives E and F.

Potential Recreation Opportunities

The potential recreation opportunities listed in Chapter 2 (Enhancement Opportunities) could be accomplished even if the no-action alternative is implemented.

Scenic Quality

Direct, Indirect, and Cumulative Effects

Field observations, topographic map analysis, and computer-generated perspective simulations were used to determine the impacts of the action alternatives on the visual quality of the Indian River Project Area. All action alternatives would result in visual impacts of varying degrees.

Some timber activities create unnatural lines and textures in the landscape which contrast with the rough, even-textured characteristic of Southeast Alaska old-growth rain forest. This contrast may be evident to the average national forest visitor. However, timber harvest and road building activities in the Indian River Project are located primarily in the interior of Chichagof Island, shielded from viewing from Tenakee Inlet by the intervening mountains.

Alternative A

Alternative A, the No-Action alternative, would produce no additional visual changes in the Project Area.

VCU 2041 - Game Creek

All of the action alternatives would meet the adopted VQO of Maximum Modification.

VCU 2160 - Freshwater Creek

All of the action alternatives would meet the adopted VQO of Maximum Modification.

VCU 2200 - Tenakee Springs

All planned harvest units in the action alternatives meet the adopted VQO of Maximum Modification. Alternatives B, C, and E would use the former LTF site at Sunny Cove. Removing alder from the site would expose the white rock at the site to view, creating a visual impact. Alternative F would use the new LTF site at Sunny Too. This new LTF and access road, which requires a large cut through light-colored rock, would have strong visual impacts on State land.

VCU 2210 - Whip Station

There are no planned harvest units in the VCU, so all alternatives meet the adopted VQOs.

Alternatives B and D would use the new LTF site at 10-Mile Creek. The LTF and its access road have potential to create a strong visual impact because of the heavy excavation which will likely be necessary. This development may not meet the adopted VQO of Partial Retention in the foreground required in a Modified Landscape LUD; however, the 1997 TLMP provides for exceptions to meeting the VQO in the case of some non-conforming developments, including log transfer facilities.

VCU 2221 - 10-Mile Creek

All of the action alternatives would meet the adopted VQOs of Retention and Maximum Modification. Most of the timber management activities occurring in this VCU are either not seen from Tenakee Inlet, or are mitigated by partial harvesting. Future visual conditions in Alternatives C, E, and F remain unchanged.

Visual Recovery Rates

The potential for visual impact is greatest right after timber is harvested; stumps and debris, fresh road cuts and fills, and exposed boles and limbs of adjacent stands dominate the visual setting. By the fifth year of regeneration, the new forest is filling out, and low-lying vegetation, alder, and young trees begin to cover the stumps and exposed ground. From year 5 to 20, the young trees have become established, reaching a height of approximately 15 feet. After 20 years, the forest visitor would see a stand of spruce and hemlock, with some Alaska-cedar in the foreground. In the middle-ground, the contrast between the new forest and mature forest would be very obvious.

At the end of 50 years, the new forest would reach a height of approximately 50 feet. The canopy would be closing and the new forest would appear very dense. Toward the end of 80 years, the stand would reach 75 percent of its mature height. The canopy would appear full with crowns touching, allowing little sunlight to reach the forest floor and little understory vegetation. At 100 years, little visual difference would be noticed between the 100-year forest and an adjacent mature forest. Timber would reach approximately 100 feet in height and appear healthy, lush, and with full canopy.

Cumulative Effects

While individual harvest units may meet the assigned VQOs, when viewed as a group along with previous harvest they may disturb too much of the natural landscape during one period of time. This could create a significant cumulative effect.

The Maximum Disturbance Threshold (MDT) is a way of determining the level of visual impacts over broader areas by evaluating the percentage of harvested area seen in larger viewsheds (see glossary). If the harvested area is over the prescribed threshold, the MDT is exceeded. An evaluation of the MDT for Indian River area shows that no VCU will exceed the MDT under the VQO scenario established by the 1997 TLMP.

Heritage Resources

In Section 106 of the National Historic Preservation Act (NHPA), Federal agencies are directed to take into account the effect of a project such as the Indian River Timber Sale(s) on cultural resources. Cultural resources are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for the inclusion in the National Register of Historic Places. According to Section 106, historic preservation concerns are to be identified, and any potential conflicts with the proposed project are to be resolved in the public interest.

The basic steps to be followed for the National Preservation Act, Section 106 are:

- early consultation for resource identification/concern;
- preparation of a Research/Survey Design for the Project Area;
- completion of a structured survey in accordance with the Project Area Research/Survey Design;
- identification of those resources considered eligible for the National Register of Historic Places (i.e., complete a Determination of Eligibility); and
- a formal Determination of Effect on identified resources, as outlined in 36 CFR 800.

The Section 106 review for the Indian River Project is completed. Heritage Resource surveys were conducted in the Project Area during the 1993, 1994, and 1995 field seasons. As a result of these surveys, seven archaeological sites were identified. (See Table 3-38 in Chapter 3.) Of these sites, three are located on National Forest System Land. One of the three (the East Tenakee Trail) has been determined eligible for inclusion in the National Register.

Direct and Indirect Effects

Direct effects on historic sites are best measured as: alterations to the site settings; alterations of above-ground objects, features and structures; and disturbance of subsurface deposits. Indirect effects could include changes in stream channel, sedimentation patterns, or slope instability -- all brought about by project activity in the nearby vicinity of the site.

The distinction between direct and indirect effects can be subtle. Impacts can occur due to project-related activities, increased public access, or from natural processes. Impacts resulting from project activities could include partial damage or total destruction due to ground-disturbing actions, increased pedestrian or vehicular traffic over a site, or actual looting. Natural processes can be exacerbated by timber-related activities, which can lead to adverse effects to historical sites.

The degree of risk for impact on a site is best measured by distance from the proposed activity areas. The Chatham Area has operated on a “100 meter” rule. Those activity areas which fall within 100 meters (approximately 330 feet) of a site are determined to have a direct effect on the site. Clearly, the farther away the project activity is from the site, the less likely that the site will be affected. This does not preclude the possibility of an indirect effect; however, these are much more difficult to predict. Factors listed above do not necessarily occur with predicted regularity, and are best determined by a systematic monitoring program.

Alternative F is the only alternative that would have a direct effect on any historic property. This alternative would have an adverse effect on the East Tenakee Trail -- an historic trail (49 SIT 468) which extends for eight or nine miles along the north shore of Tenakee Inlet. (See Chapter 3, Heritage Resources). A determination of adverse effect has been completed and SHPO has concurred with this determination.

This trail was originally constructed for foot traffic between Tenakee Springs and the cannery which was located at Cannery Cove. It was significantly enhanced by the CCC during the 1930s. As stated above, it has been determined eligible for listing to the National Register of Historic Places (Iwamoto 1996). The State Historic Preservation Officer (SHPO) has concurred with the determination of eligibility.

Specifically, the East Tenakee Trail starts approximately three miles west of Tenakee Springs, and extends five or six miles east of the town to Coffee Cove. In Alternative F, Forest Service Road 75002 would be built over approximately 60 meters (200 feet) of the current trail, to access the Sunny Too LTF site. Implementation of mitigation measures would be required prior to the construction of this portion of the road.

Mitigation measures would include consulting with the SHPO and the Advisory Council on Historic Preservation, and developing a Memorandum of Understanding (MOU). The MOU would outline what measures the Forest Service shall do to be in compliance with the National Historic Preservation Act. It would also ensure that:

- alternative measures have been taken into consideration before deciding that this is the best alternative to select; and
- adequate documentation has been completed and submitted for the site before project activity begins.

Mitigation for the adverse effect may include interpretation along the East Tenakee Trail. Consultation with the people of Tenakee Springs would be an integral part of the mitigation process.

Cumulative Effects

Cumulative effects on heritage resources can be measured through natural erosion processes and/or by the amount of development on lands containing heritage resources.

While current and future project activity obviously do not impact an historic event, continued development of federal projects within the area can certainly have a cumulative impact on the site where the event occurred. As in the case of the East Tenakee Trail, historic sites identified within the Project Area have been adversely affected by past timber harvest activities (in this instance, activities from the 1970s).

Since the early 1980s, the Chatham Area has consistently implemented the inventory, evaluations, and assessment of effects through the National Historic Preservation Act, Section 106 process. If the historic properties identified are avoided and/or protected using appropriate mitigation measures, there should be no additional cumulative effects to these sites.

Land Status

Direct and Indirect Effects

Only effects on non-Federal lands are discussed in this section.

Federal Right-of-Way

The right-of-way along the Indian River Road (7500) through State land would be utilized in Alternatives B, C, E, and F.

Log Transfer Facilities

Alternatives B, C, and E would reconstruct the existing log transfer facility (LTF) at Sunny Cove. (See City of Tenakee Springs/Sunny Cove Tidelands discussion below for impacts.) Alternatives B and D would construct a new LTF on State tidelands at the 10-Mile Creek site. Alternative F would construct a new LTF on State tidelands at the Sunny Too site. The Forest Service currently is not authorized to use any of these sites. All local, state and federal permits and authorizations would need to be acquired prior to construction.

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The new road construction accessing the Sunny Too LTF in Alternative F crosses less than one mile (0.15 mile) of State land. The Forest Service would need to acquire an easement from the State prior to construction.

East Tenakee Trail

Construction of the access road to the Sunny Too LTF site in Alternative F would require relocation of approximately 200 feet of the East Tenakee trail. The easement for this trail is held by the City of Tenakee Springs. Relocating the trail would require approval by the State of Alaska, Department of Natural Resources. (See Heritage Resource section in this chapter for further discussion of the trail.)

City of Tenakee Springs/Sunny Cove Tidelands

Alternatives B, C, and E would require authorization from the City of Tenakee Springs to use the Sunny Cove log transfer facility (LTF).

Memorandum of Understanding: Tenakee Springs and the Forest Service. A Memorandum of Understanding (MOU) was signed by Regional Forester Phil Janik and Tenakee Springs mayor Louis Heins in November, 1996. The MOU addresses concerns of Tenakee Springs residents regarding use and occupation of City-owned tidelands in Sunny Cove. Sunny Cove is located approximately three miles southeast of the City of Tenakee Springs. Previous harvest of the Indian River, 10-Mile Creek, and Freshwater Creek drainages was accomplished utilizing an LTF site in the cove. This site was last used in 1986.

The MOU specifically addresses the use of the tidelands area at, and adjacent to, the former LTF site, and documents compensation to be paid to the City of Tenakee Springs for use or occupation of their tidelands. As long as the Forest Service or its Timber sale Purchasers and Assignees comply with the terms of the MOU, Tenakee Springs agrees to not terminate the MOU prior to December 31, 2003. See Appendix C for mitigation measures requested by the City of Tenakee Springs and addressed in the MOU. Mitigation measures would be incorporated into the timber sale contract as appropriate.

Comparison of Alternatives

The action alternatives include the reconstruction of one LTF at the Sunny Cove site, and construction of new LTFs at the Sunny Too and 10-Mile Creek sites. The Forest Service does not currently have authorization to use any of these sites.

Alternatives C, D, E, and F would require acquisition of one LTF authorization, while Alternative B would require acquisition of two. Alternative B would result in the greatest conflict, in regard to land status, due to the number of LTFs (two) and governments involved. Alternatives C, E, and F would result in slightly less conflict, since only one LTF would be involved. Alternative D would result in the least conflict, since non-Federal lands around Tenakee Springs are avoided in this alternative.

The access road to the Sunny Too LTF site would conflict with State Selection AA-15077. Surveyed boundary lines would reduce the possibility of unintentional encroachment on State land.

There are no known Native Allotment Applications, and thus no possibility of encroachment on these lands.

Transportation System

Direct, Indirect, and Cumulative Effects

The transportation systems for the action alternatives were developed to provide road access to harvest units that could be logged using either conventional (e.g., ground-based or cable systems) or non-conventional means (e.g., helicopter). This section focuses on the access needs of each alternative, and the effects of the alternatives on the transportation system. The discussion is grouped into the following categories: roads, stream crossings and bridges, and log transfer facilities (LTFs). The section concludes with a summary comparison of alternatives.

Roads

Table 4-30 summarizes existing and proposed roads for each alternative. Estimated costs for these roads are shown in Table 4-28. Road Management Objectives (RMOs) are displayed by alternative in Appendix D.

Detailed discussions of roading effects on resources in the Project Area (e.g., soil, fish, water, recreation) are included in the specific resource sections in this chapter.

Table 4-28
Projected Road Costs by Alternative

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
New Construction	$1,634,420	$1,334,440	$1,824,220	$1,224,940	$1,395,760
Reconstruction	55,700	54,325	26,825	54,100	54,900
Temporary	180,900	332,100	283,500	296,100	388,800
Total	$1,871,020	$1,720,865	$2,134,545	$1,575,140	$1,839,460

Source: Costa 1996

Road Density

Road density is a measure of road miles per square mile of land base in a given area such as a VCU. Generally, the higher the density, the higher the potential for environmental impacts such as erosion, wildlife disturbance, and disruption of recreation experience. Table 4-29 shows that for all action alternatives, the road density within the Project Area would be approximately the same.

Table 4-29
Road Density by Alternative

VCU	Square Miles	A	B	C	D	E	F
2041	1.2	0.00	0.00	0.52	0.52	0.00	0.52
2160	16.4	0.44	0.76	0.98	0.98	0.96	0.98
2200	27.7	0.45	0.51	0.47	0.45[1]	0.46	0.51
2210	7.4	0.00	0.10	0.10	0.10	0.00	0.00
2221	8.3	0.42	0.57	0.58	0.66	0.58	0.59
Average Density		0.38	0.53	0.57	0.58	0.55	0.59

Source: Costa 1996
1. Existing system roads in VCU, even though no harvest is planned in Alt. D.

Table 4-30
Summary of Existing and Proposed Road Miles by Alternative and VCU

VCU	Route	Status	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
2041	7500	P	0.00	0.00	0.16	0.16	0.00	0.16
	Temp	T	0.00	0.00	0.45	0.45	0.00	0.45
2160	7500	E	4.97	4.97	4.97	4.97	4.97	4.97
	7502	E	1.82	1.82	1.82	1.82	1.82	1.82
	7507	E	0.08	0.08	0.08	0.08	0.08	0.08
	7509	E	0.42	0.42	0.00	0.00	0.00	0.00
	75021	E	0.22	0.22	0.22	0.22	0.22	0.22
	7500	P	0.00	1.73	2.05	2.05	1.73	2.05
	7508	P	0.00	0.00	1.02	1.02	1.02	1.02
	75007	P	0.00	1.76	1.81	1.81	1.81	1.81
	75021	P	0.00	0.54	0.54	0.54	0.54	0.54
	750071	P	0.00	0.99	0.99	0.99	0.99	0.99
	Temp	T	0.00	2.61	2.61	2.61	2.61	2.61
2200	7500	E	9.61	9.61	9.61	0.00	9.61	9.50
	7501	E	0.61	0.61	0.61	0.00	0.61	0.61
	75003	E	0.13	0.13	0.00	0.00	0.00	0.13
	75004	E	0.60	0.60	0.60	0.00	0.60	0.60
	75012	E	0.18	0.18	0.18	0.00	0.00	0.18
	7501	P	0.00	0.94	0.94	0.00	0.94	0.94
	75002	P	0.00	0.00	0.00	0.00	0.00	0.15
	75003	P	0.00	0.54	0.00	0.00	0.00	0.54
	75004	P	0.00	0.56	0.56	0.00	0.56	0.56
	Temp	T	0.00	1.02	0.54	0.00	0.44	1.02
2210	7502	P	0.00	0.76	0.00	0.76	0.00	0.00
2221	7502	E	3.52	3.52	3.52	3.52	3.40	3.52
	75023	E	0.21	0.00	0.00	0.00	0.21	0.21
	75028	E	0.12	0.12	0.12	0.12	0.12	0.12
	7502	P	0.00	0.94	0.27	0.27	0.00	0.00
	75028	P	0.00	0.00	0.80	0.80	0.80	0.80
	Temp	T	0.00	0.09	0.09	0.09	0.24	0.24
Total Existing Road Miles			22.49	22.28	21.73	10.73	21.64	21.96
Total Proposed Road Miles			0.00	7.77	9.14	9.07	8.39	9.56
Total Temporary Road Miles			0.00	2.01	3.69	3.15	3.29	4.32
Total Road Miles by Alternative			22.49	32.06	34.56	22.95	33.32	35.84

Source: Costa 1996
Note: Not all existing roads are used in each alternative.
E = Existing road
P = Proposed Road
T = Temporary Road

Stream Crossings and Bridges

During field reconnaissance of existing and proposed road routes, engineers identified stream crossings where drainage structures would need to provide for fish passage. In some cases (e.g., large "V" notches), installation of a bridge would have fewer resource impacts than large amounts of fill material and a culvert. In other instances (e.g., old bridges on the existing road system), bridges could be replaced with large, oversized culverts and still provide for fish passage. This would reduce construction costs in the short-term, as well as long-term maintenance costs. See Road Cards (Appendix I) for specific design requirements and recommendations for drainage structures.

Eight stream crossings likely requiring bridges were identified on new roads. The number of bridges to be constructed or reconstructed for each alternative is displayed in Table 4-31. The estimated costs are also shown. There are a limited number of log stringers available for log bridge construction in the Project Area. Some bridges, located on temporary roads or roads that would be closed upon completion of logging, may be built with log stringers. Steel modular bridges are planned for roads that would be kept open after harvest. This takes advantage of the longer life and lower long-term maintenance costs of steel structures versus the short life span of log stringer bridges. Steel modular bridges are also capable of being removed and used in other locations, which would reduce overall costs.

Table 4-32 shows that bridge costs play a major role in the economics of this project. Some sort of "bridge re-use" plan may need to be in place on the Chatham Area to meet the bridging needs for the Indian River transportation system. There are no immediate plans for re-entry into the Project Area within the foreseeable future (20 years). This expected period of non-use, combined with the cost of bridges for this project, raises the following concerns: (1) the maintenance of the large number of bridges during this period; or (2) the closure of the road systems and use of these bridges elsewhere on the Chatham Area.

Table 4-31
Projected New and Replacement Bridge Costs by Alternative

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing bridges: Replacement Cost (number of bridges)	$1,047,000 (22)	$1,047,000 (22)	$75,000 (15)	$361,700 (22)	$361,700 (22)
New bridges: Construction cost (number of bridges)	$38,750 (7)	$38,750 (7)	$23,750 (6)	$38,750 (7)	$38,750 (7)
Total Bridge cost (number of bridges)	$1,085,750 (29)	$1,085,750 (29)	$98,750 (21)	$400,450 (29)	$400,450 (29)

Source: Costa 1996

Table 4-32
Estimated Total Construction, Development and Mobilization Costs

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Roads Construction and reconstruction cost	$1,871,020	$1,720,865	$2,134,545	$1,575,140	$1,839,460
Bridges Construction and replacement cost	$1,085,750	$1,085,750	$98,750	$400,450	$400,450
LTF, Camp Development, Mobilization Costs	$232,800	$250,500	$284,300	$264,000	$221,100
Total	$3,189,570	$3,057,115	$2,517,595	$2,239,590	$2,461,010

Source: Costa 1996

Log Transfer Facilities (LTFs)

Three LTF sites were identified for this project: (1) a proposed site near 10-Mile Creek; (2) the previously used bulkhead site in Sunny Cove; and (3) Sunny Too, located just west of the former Sunny Cove LTF. All three sites meet the siting guidelines developed by the LTF Guidelines Technical Subcommittee (see Appendix K). Two types of LTF are proposed for this project: vertical bulkhead and drivedown ramp with rails. (See the Transportation section in Chapter 3.) Table 4-36 displays the LTFs by alternative.

LTF Construction

The most direct physical effect during LTF construction is the loss of intertidal and shallow subtidal habitats resulting from the placing of fill material. The extent of the impact depends on the type of LTF system selected (see Table 4-33). The greatest area of fill for the LTF sites planned in the Project Area would occur under Alternative F, at the proposed Sunny Too site.

Table 4-33
Intertidal and Shallow Subtidal Fill Acres by LTF Type and Alternative

	Acres of Fill				
LTF	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Sunny Cove (drive-down ramp)	0.15	0.15			
Sunny Cove (bulkhead)				0.13	
10-Mile Creek (drive-down ramp)	0.15		0.15		
Sunny Too (bulkhead)					0.50[1]
Total Fill Acres	0.30	0.15	0.15	0.13	0.50

Source: Costa 1996
1. Includes access road on tidelands

LTF Operation

Timber harvest operations at the LTF site (such as log dumping, sorting, and rafting) result in bark and wood debris deposition, short-term changes in marine substrate characteristics from bark accumulation, and loss of whole logs through sinkage. Impacts would vary with the type of log entry system, water depth, substrate composition, log species, season and volume of the operation, and prevailing currents and circulation patterns (Costa 1996).

Bark loss and deposition occur during the transfer of logs from land to water. Alternative C would have the greatest estimated area of bark deposition as a result of having the highest volume transported over a drive-down ramp. Bark dispersion patterns would be affected by currents and tides. Debris dispersion would be greatest at the 10-Mile Creek site due to greater tidal influences along the Tenakee Inlet (Boes 1996). (See Tables 4-33 and 4-34).

Table 4-34
Acres of Bark Deposition and Dispersion at LTF Sites

LTF Site	Transfer System	Area of Bark Deposition	Area of Bark Dispersion
Sunny Cove	Drive-down ramp	0.10	1.25 (includes area from prior harvest activity)
	Bulkhead	<0.01	
10-Mile Cr.	Drive-down ramp	0.05	1.50
Sunny Too	Bulkhead	<0.01	<0.01

Source: Costa 1996

Table 4-35 displays the volume to be transported over the LTFs for each action alternative. Log rafting is proposed for Alternatives B, C, and D, and barging is proposed for Alternatives E and F. While barging eliminates the concern of bark debris, it is more costly to implement.

Table 4-35
Timber Volume (mmbf) by Alternative and LTF Type

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Sunny Cove	9.9 (Ramp)	28.7 (Ramp)		24.5 (Bulkhead)	
10-Mile Creek	13.9 (Ramp)		24.0 (Ramp)		
Sunny Too					36.9 (Bulkhead)

Source: Costa 1996

Impacts to Commercial Fisheries Resources

Marine fisheries resources could be impacted through the smothering of marine substrates, macro-algae, and rooted marine plants used by fish for spawning. Loss of incubating eggs would also be an impact. Fisheries resources/habitats observed in the vicinity of the LTF sites include herring spawn, sea cucumber, and dungeness crab habitat. Herring spawn has been documented in the Sunny Cove area.

The use of either the Sunny Cove LTF site or the Sunny Too site may be affected if herring spawn does occur there again. This would be addressed through the permitting process, which would include input from the State of Alaska. At this time, there is no documentation of herring at the proposed 10-Mile Creek LTF site. Sea cucumbers were noted at all three LTF sites. However, their numbers are not great enough for commercial harvest (Boes 1996). A few Dungeness crab were noted at all three sites during the dives. None of the action alternatives are expected to significantly impact populations of commercial marine resources.

Other Impacts to Marine Resources

Potential indirect effects associated with LTF construction and operation include the introduction of debris into nearshore waters. Such debris might consist of log bundling and rafting straps; bottles, cans, and other refuse; and spilled petroleum products from vehicle and boat operations or maintenance. Fuel oil spills from LTFs are generally not common, but could occur and result in contamination of local waters. Most oil spills are small and occur during fueling operations.

Adverse effects to marine organisms are not anticipated to be of concern because of the tidal mixing and dilution rates expected in all three LTF sites. BMPs, contract clauses, and permit language require that spills be reported and minimized as much as possible.

Compliance with Section 401 water quality certification under the Clean Water Act would also minimize chemical impacts to marine organisms and habitat. Adverse effects due to leachates from wood and bark debris during log dumping would be minimal due to the intermittent use of the LTFs, and low timber volume to be transported. Strong tidal influences would also reduce water quality impacts.

Comparison of Alternatives

Alternative B

This alternative proposes construction of 7.8 miles of new road, including the installation of seven new bridges. Approximately 22.3 miles of existing road would be reconstructed, and 22 bridges replaced. Two miles of temporary road would be built, and then obliterated after this harvest entry. (See Table 4-36.)

In Alternative B, two LTF sites are proposed: the former LTF site at Sunny Cove and a new LTF site at 10-Mile Creek. The Sunny Cove bulkhead would be reconstructed to accommodate a drive-down ramp with rails. Use of the former site would impact the bark zone of deposit that exists as a result of past logging activities (See Marine Environment section, Chapter 3). This deposit zone is anticipated to increase minimally as a result of harvest from this project. A Memorandum of Understanding (MOU) has been signed between the Forest Service and the City of Tenakee for the use of the City-owned tidelands at the Sunny Cove site. (See Mitigation Measures, in Appendix C.)

The proposed LTF at 10-Mile Creek would also be a drive-down ramp with rails. This site is not as protected as Sunny Cove. The rafting area adjacent to the 10-Mile Creek LTF is located within Tenakee Inlet which is noted for frequent high winds. Since this site affords very little protection from wind, it is anticipated the operator would form the logs in half-rafts, and then move these across the inlet to Seal Bay. There they would be re-formed into larger rafts for towing. Permits would be required from the Environmental Protection Agency (EPA), Corps of Engineers (COE), and Department of Natural Resources (DNR) of the State of Alaska for constructing the ramp and placing logs into the water at this site.

The 10-Mile Creek site would be accessed by construction of 1.70 miles of new road, connecting the LTF with the current end of Road #7502. This route runs along the east side of 10-Mile Creek. A potential slide area has been identified and mitigation measures are incorporated in the design of the road (see the Soils and Water Quality section).

While either LTF site could be used, it is likely that only one would be used. The LTF at Sunny Cove is the most cost effective site for the Indian River Project.

Table 4-36
Summary Comparison of Transportation System and Facilities, by Alternative

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Roads (Miles)					
New Construction	7.8	9.1	9.1	8.4	9.6
Existing	22.3	21.7	10.7	21.6	22.0
Temporary	2.0	3.7	3.2	3.3	4.3
Bridges					
Replacement	22	22	14	22	22
New	7	7	4	7	7
LTF					
Location	10-Mile Creek, Sunny Cove	Sunny Cove	10-Mile Creek	Sunny Cove	Sunny Too
Type	Drive-down ramp	Drive down ramp	Drive down Ramp	Bulkhead	Bulkhead
Transport Method	Raft	Raft	Raft	Barge	Barge
Camp Location*	Corner Bay	Corner Bay	Seal Bay	Corner Bay	Corner Bay
Volume (mmbf)	23.8	28.7	24.0	24.5	36.9

Source: Costa 1996
* Log camp locations shown have been used by timber purchasers working in the Tenakee Inlet area.

Alternative C

This alternative proposes construction of 9.1 miles of new road, including the installation of seven new bridges. Approximately 21.7 miles of existing road would be reconstructed, and 22 bridges replaced. Approximately 3.7 miles of temporary road would be built, and then obliterated after this harvest entry. (See Table 4-36.)

In Alternative C, the former LTF site at Sunny Cove would be used. The Sunny Cove bulkhead would be reconstructed to accommodate a drive-down ramp with rails.

Alternative D

This alternative proposes construction of 9.1 miles of new road, including the installation of four new bridges. Approximately 10.7 miles of existing road would be reconstructed, and 14 bridges replaced. Approximately 3.2 miles of temporary road would be built, and then obliterated after this harvest entry. (See Table 4-36.)

Under Alternative D, no roading activity is proposed in the Indian River drainage (VCU 2200). The section of existing Road # 7500 in this drainage would not be reconstructed and the log stringer bridges would be not replaced. The bridges would deteriorate to a point of having to close this road system to any vehicular traffic. Two existing steel bridges in this segment could be removed and used in other roads needed for this alternative.

Alternative E

This alternative proposes construction of 8.4 miles of new road, including the installation of seven new bridges. Approximately 21.6 miles of existing road would be reconstructed, and 22 bridges replaced. Approximately 3.3 miles of temporary road would be built, and then obliterated after this harvest entry. (See Table 4-36.)

Under Alternative E, the existing Sunny Cove bulkhead would be reconstructed as a barging facility. The existing rock pit above the LTF site and upland working area would provide areas for a maintenance shop, fuel storage, and log bundle storage. A second rock pit, located a half mile from the LTF site, has adequate area for sorting and log bundle storage.

Alternative F

This alternative proposes construction of 9.6 miles of new road, including the installation of seven new bridges. Approximately 22 miles of existing road would be reconstructed, and 22 bridges replaced. Approximately 4.3 miles of temporary road would be built, and then obliterated after this harvest entry. (See Table 4-36.)

Alternative F proposes constructing a LTF bulkhead (Sunny Too) on a partially submerged rock formation in the Sunny Cove area, located on State of Alaska tidelands west of the former LTF site. The bulkhead facility would be constructed with log cribbing and back-filled with clean shot rock. The Sunny Too LTF would not be subject to the MOU with the City of Tenakee. A tidelands permit would have to be obtained from the State of Alaska, however, for placing 4,000 to 5,000 cubic yards of clean shot rock needed for bulkhead and access road construction.

Alternative F would also require constructing 0.15 miles of new road (#75002) to access the LTF. The State DNR has indicated a willingness to issue a road easement for this, over State lands to the tidelands (Schauwecker 1996). The road alignment overlaps approximately 200 feet of the East Tenakee trail, which would require a practical and visually acceptable relocation. (See the Heritage and Lands sections in this chapter.)

Logging Camps

Alternatives B, C, E, and F would use either a floating camp or the former upland camp area at Corner Bay, under a special use permit. (See Table 4-36.)

A floating camp near 10-Mile Creek would likely be used for Alternative D. Seal Bay, located four miles south of 10-Mile Creek, is the closest bay affording protection for both log storage and placement of the floating camp. Saltery Bay, located nine miles southeast of the 10-Mile Creek LTF, is much smaller, and over twice as far from the Project Area as the Seal Bay location.

Both Seal Bay and Long Bay (located northwest of Seal Bay) are located in an area designated in the 1997 TLMP as an Old Growth Reserve (OGR). Since there will be no harvest activity or ground disturbance within the OGR, log storage and floating camp anchorage are compatible with this designation. Minimum needs in the immediate area of a floating camp include a year-around fresh water source, a location for incinerating burnable garbage, and several shore ties to hold the barge in place. Occupation of tidelands along with access to the upland would probably not exceed four years.

All alternatives would require boating to and from the Project Area from the south side of Tenakee Inlet, regardless of which camp site is selected.

Road and Unit Network Analysis

The computer Scheduling and Network Analysis Program (SNAP) was used to analyze the units and roads to be included in each of the harvest alternatives for this project. After the alternatives were developed, a final SNAP analysis was completed for each to determine its net economic value. These values provided a comparison between the alternatives.

Table 4-37 displays the results and represents the SNAP net value of the alternatives. The relative ranking in the table shows that Alternative F has the highest SNAP value and Alternative B has the lowest. The proposed harvest volume, miles of road utilized, and facilities costs are also displayed for comparison. The total facilities cost per mbf displayed in Table 4-37 range from $62 to $127 per mbf. This is a high cost compared to past timber offerings on the Tongass National Forest, primarily because of expensive bridge replacement.

Table 4-37
Net (SNAP) Values

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Current Net Value (SNAP) and relative ranking	$14.38 (5)	$84.48 (2)	$68.27 (4)	$80.43 (3)	$94.09 (1)
Proposed harvest volume (mmbf)	23.8	28.7	24.0	24.5	36.9
Facilities: Cost/MBF	$127.07	$99.26	$97.58	$87.48	$62.00
Total Road Miles	32.06	34.56	22.95	33.32	35.84

Source: Peterson 1996

Economics and Social Values

Direct, Indirect, and Cumulative Impacts

Tongass timber sale projects have historically had a variety of positive and negative effects on local communities. To communities dependent on the timber industry, these projects may be seen as beneficial to their way of life, with the guarantee of continued employment for their residents. To other communities more dependent on subsistence gathering, these projects may act as a hindrance in the day-to-day lives of their residents.

The Project may have effects on local subsistence and recreation patterns. This would be due mainly to wildlife habitat modification, enhanced or restricted access, changes to the visual and aesthetic character of the area, and new competition from logging camp residents over the short and long term. On the other hand, the Project would have a positive effect on local community economies if a small, local wood products industry were developed, or if the harvest operations were to generate logging and other jobs for local residents. In addition, the Project would contribute to Federal Treasury payments (twenty-five percent fund) to each community.

For the Indian River Project, an attempt was made to strike a balance to deliver forest resources to the public in all action alternatives. A reasonable range of alternatives has been developed to meet the purpose and need for the Project, using multiple-use and sustained-yield principles and the concepts of ecosystem management and forest health. Furthermore, these alternatives were developed with a recognition of the desires of the public, current policies, and political pressures. Each alternative delivers a broad array of forest resources in varying degrees.

Wood Products Industry

The Indian River Project is not expected to have major effects on the size, demographic make-up, or growth trends of the Southeast Alaska population. This is due, in part, to the fact that the five action alternatives are designed to maintain and contribute to a stable level of timber harvest in the Tongass National Forest. This, in turn, leads to a stable community environment. However, under the no-action alternative, operators of some logging and milling enterprises may be forced to slow down or shut down their operations altogether if no other sources of timber are located. Under this scenario, a negative ripple effect could spread out across the various economic sectors in Southeast Alaska that indirectly benefit from timber related employment. This would likely result in slower growth or declining populations in some area communities. Likewise, declining timber receipts could result in smaller Federal Treasury payments to the communities over the long term. Over the short term, Southeast Alaska Economic Funds would mitigate this potential reduction in payments, and help maintain community stability. Implementation of any of the action alternatives is not expected to have any major direct, indirect, or cumulative impacts on civil rights, minorities, and women.

The National Forest Management Act of 1976 (NFMA) explicitly requires economic efficiency analyses of National Forest management proposals. The Forest Service has generally tried to achieve cost-efficient management (lowest possible input cost per unit of output). However, systematic evaluation of all costs and benefits from practices and activities has been undertaken only in recent years. Also, while economic efficiency must be analyzed and considered, it is not the sole decision criterion.

To estimate the economic effects of the alternatives, it is assumed that other factors affecting the wood products market remain constant. It is important to note that the amount of timber offered for sale by this project is only one of many factors that ultimately

influences employment in the region's wood products industry. Other factors which would influence employment are:

- the type of wood processing facilities available in the region;
- the supply, demand, and value of the products manufactured;
- worker productivity;
- the amount of capital investment;
- the technology employed;
- interest rates;
- foreign exchange rates; and
- timber management decisions made by other forest owners.

The employment and income effects of the alternatives were estimated using the industry-wide average of 8.24 jobs per million board feet harvested. This figure was calculated by the Forest Service economic model IMPLAN (in base year 1992, see Table 4-38 for figures). The associated income effects were also calculated using coefficients generated by the IMPLAN model. The economic effects reported in Table 4-38 include direct and secondary effects. For purposes of this analysis it was assumed that the timber volume in the action alternatives would be offered in varying amounts over a four-year period. Harvest is assumed to occur during the year following the sale award. Actual harvest may occur over either a shorter or a more extended time frame.

Table 4-38
Direct and Indirect Employment and Income by Alternative

Year Harvest is Planned	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1st Year No. Jobs	0	84	79	75	55	90
2nd Year No. Jobs	0	69	65	60	55	75
3rd Year No. Jobs	0	43	49	39	47	74
4th Year No. Jobs	0	0	44	24	45	65
Average Annual Number of Jobs	0	49	59	49	50	76
Total No. of Jobs	0	196	237	198	202	304
Average Annual Earning ($ millions)	0	$2.1	$2.6	$2.2	$2.2	$3.3
Total Earnings ($ Million)	0	$8.4	$10.1	$8.5	$8.6	$13.0

*Assumes harvest would begin in 1999 and be completed in 2002
Source: Regan and Peterson 1997.

Timber harvested under the action alternatives would provide a source of wood to independent, operating mills throughout the region. This project alone would not be of sufficient duration to encourage investment in new facilities. The primary effect would be retention of existing employment levels.

The no-action alternative (Alternative A) could result in fewer timber-related jobs if regional mills are not able to purchase wood from another source. See Chapter 4, Timber for further discussion of timber economic effects.

Commercial Fishing Industry

Current standards and guidelines for timber harvest activities are expected to limit adverse effects on fish habitat and fish populations. Jobs in the fishing industry are not expected to change due to implementing any of the project alternatives.

Subsistence Recreation, and Tourism

Alternative F would have the greatest positive impact to a timber products industry, and the greatest negative impact to subsistence lifestyles if restrictions on subsistence uses are imposed. The tourism industry may also be negatively impacted if commercial recreation providers decide to take their customers somewhere else for an Alaskan experience, or reduce the size of their operations. Alternative A, the no-action alternative, would have the least negative impact to subsistence lifestyles and the tourism industry, but would not support a local or regional wood products industry.

Of the action alternatives, Alternative D would have the smallest negative impact to subsistence lifestyle because most harvest activities are located away from subsistence use areas near Tenakee Springs.

Although Alternative B harvests the smallest amount of timber of all the action alternatives, it spreads impacts throughout the Project Area by partially harvesting more acres than clearcutting them. Over the short term this could be considered a positive effect by subsistence users and the tourism industry. Over the long term, however, partial harvest would result in negative impacts. See Chapter 4, Subsistence and Recreation sections for discussions of economic effects to these resources.

Community Effects

Angoon

Implementation of any of the action alternatives is not expected to have any major direct, indirect, or cumulative impacts on the socioeconomics of Angoon and its residents. This is due largely to Angoon's dependence on commercial fishing and subsistence, rather than timber, as the primary factors influencing the community. It is possible that some residents may be hired for timber harvest and road construction which would add income to the community, but this number would probably be small.

Hoonah

Implementation of any of the action alternatives is not expected to have any major direct, indirect, or cumulative impacts on the socioeconomics of Hoonah and its residents. Commercial fishing and subsistence would continue as primary factors influencing Hoonah. It is possible that some residents may be hired for timber harvest and road construction which would add income to the community; however, it would be difficult to determine any numbers or figures at this time.

Tenakee Springs

Implementation of any of the alternatives is not expected to have any major direct, indirect, or cumulative impacts on the socioeconomics of Tenakee Springs and its residents. This is due largely to Tenakee Springs' dependence on commercial fishing and subsistence, rather than timber, as the primary factors influencing the community. There could be short-term impacts on the growing tourism sector if visitors decide they do not want to see timber management activities at the LTF site(s). The City of Tenakee Springs would receive income from user fees and taxes from the LTF agreement for the Sunny Cove site (Alternatives B, C, and E). It is possible that some residents may be hired and some goods and services purchased locally by contractors for timber harvest and road construction activities. This would add income and tax revenue to the community. Some residents that use motorized vehicles to access the road system may feel that their traditional lifestyle has been restricted by closing roads. However, the road system would remain open to non-motorized means of access, such as hiking, cross-country skiing, and mountain biking.

Other Environmental Considerations

Implementing any action alternative may result in some adverse environmental effects that cannot be effectively mitigated or avoided if the action is to take place. The inter-disciplinary procedure used to identify specific harvest units and roads was designed to eliminate or reduce the significant adverse consequences. In addition, the extent, severity, and duration of these effects is limited by application of standards and guidelines, BMPs, and mitigation measures. A monitoring plan has also been developed to determine if adverse consequences are occurring. The specific environmental effects of the alternatives were discussed earlier in this chapter. Proposed mitigation measures are discussed in Appendices C, I, and J. Although potentially adverse environmental effects were avoided in forming the alternatives, some adverse effects to the environment which cannot be completely mitigated may occur.

Probable Adverse Environmental Effects that Cannot be Avoided

Standards and guidelines, BMPs, and mitigation measures which prevent significant adverse effects to soil and water would be implemented. However, the potential for adverse effects does exist. Sediment production would occur as long as roads are being built and timber is harvested. Sediment would be produced by surface erosion, channel erosion, and mass movement. The monitoring plan is designed to determine to what extent these adverse consequences are occurring, and whether additional remedial measures may be necessary.

Disturbance, displacement, or loss of wildlife may occur as a consequence of habitat loss and increased human activity in the Project Area. New road construction and the human activities associated with new access to areas previously unroaded may result in effects to wildlife. Improved access into areas that previously had limited roads would have similar effects. RMOs would be implemented to control motorized vehicle access.

The amount and distribution of mature and old-growth stands would be reduced through implementation of any action alternative. The rate and severity of adverse effects varies by alternative. Because some wildlife species rely on habitat conditions provided by old-growth stands, reductions in their populations are to be expected. As old-growth and mature timber stands are converted to young even-aged stands, the capability of the Project Area to provide optimal habitat for old-growth dependent species would be reduced. Fragmentation of old-growth habitats would occur. Over the long term, canopy closure effects would result in habitat capability reductions.

Timber harvest and road construction in areas that are currently unroaded would alter natural characteristics. This would modify the recreational experiences that are offered by these areas. Some natural setting recreational opportunities would be lost by these actions.

The natural landscape would appear visually altered by timber harvest, particularly where logging activity is highly visible from travel routes. These adverse effects would eventually be reduced by growth of vegetation. Other effects on the natural appearance of the landscape include roads and structures which are highly visible despite efforts to blend them with land forms and mitigate the effect by landscaping.

The intensity and duration of these effects depend on the alternative and the mitigation measures applied to protect the resources. Most unavoidable effects are expected to be short-term (usually less than two years). In all cases, the effects would be managed to comply with established legal limits, such as maximum time for regeneration. To check and reduce these effects, monitoring procedures and mitigation measures have been

planned for those areas which may be affected. Certain monitoring procedures and mitigation measures are required by existing standards or guidelines.

Relationship Between Short-term Uses and Long-term Productivity

All alternatives would come under the mandate of the Multiple Use and Sustained Yield Act of 1960. This act requires the Forest Service to manage National Forest lands for multiple uses, including timber, recreation, fish and wildlife, range, and watershed. All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown again if the productivity of the land is not impaired.

Maintaining the productivity of the land is a long-term objective. All alternatives protect the long-term productivity of the Project Area through the use of specific standards and guidelines, mitigation measures, and BMPs. Long-term productivity could change as a result of various management activities proposed in the alternatives. Timber management activities would have direct, indirect, and cumulative effects on the economic, social, and biological environment.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected in all alternatives to avoid damage which could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the Project Area may fluctuate as a result of short-term uses; however, no long-term effects to the water resource are expected to occur as a result of timber management activities.

All alternatives would provide the fish and wildlife habitat necessary to maintain viable populations of existing native and desired non-native vertebrate species throughout the Project Area. The abundance and diversity of wildlife species depend on the quality, quantity, and distribution of habitat, whether used for breeding, feeding, or resting. Management Indicator Species are used to represent the habitat requirements of all fish and wildlife species found in the Project Area. By managing habitats and populations of indicator species, the other species associated with the same habitat would also benefit. The alternatives provide standards, guidelines, and mitigation measures for maintaining long-term habitat and species productivity. The alternatives vary in the risk presented to both wildlife habitat and habitat capability.

Timber rotations are planned on most sites for approximately 100 years. The harvest of group selection and single tree selection units would not be completed for 160 to 200 years. To ensure adequate production of timber, harvest has been scheduled to allow the earliest cut stands to mature into merchantable timber before the planned harvest of original stands is complete. When the first rotation is complete, mature, even-aged timber stands would be harvested again on a new rotation. The uneven-aged sites would have continuous cutting cycles in perpetuity. Management of the timber resource on these rotations could affect long-term productivity, depending on the intensity of silvicultural practices. Projected timber rotation lengths are not anticipated to affect long-term productivity. Mitigation measures are planned under all the alternatives to ensure future availability of other renewable resources as well.

Opportunities for dispersed recreation use (hiking, camping, fishing, hunting, and viewing the natural scenery) would be maintained and increased for future generations. The setting in which these activities occur varies by alternative, but the long-term potential for the Project Area to provide a spectrum of recreation opportunities would be maintained in all alternatives.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are decisions to use, modify, or otherwise affect nonrenewable resources such as cultural resources or minerals. It could also apply to resources renewable only over a long period of time, such as soil productivity or old-growth forests. Such commitments of resources are considered irreversible because the resource is affected to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or permanently removed. All alternatives result in some irreversible commitments, although the extent and potential for adverse effects increase in alternatives which emphasize resource extraction and utilization.

Irretrievable commitments represent opportunities foregone for the period of the proposed actions, during which other resource utilization cannot be realized. These decisions are reversible, but the utilization opportunities foregone are irretrievable. Under multiple-use management, some irretrievable commitments of resources are unavoidable due to the mutually exclusive relationship between some resources. An example of such a commitment is development of logging camps and LTFs that would be removed at the completion of logging activities. These developments occupy approximately five to ten acres and include bunkhouses, mobile homes, fuel storage facilities and such. For the three to five years that such developments exist, the opportunity to utilize these areas otherwise is foregone and thus irretrievable.

The irreversible disturbance of some types of cultural resources may occur as a consequence of management activities. This would be especially true for subsurface resources that cannot be located through surface surveys. Even with mitigation, unanticipated or unavoidable disturbances can result in the loss of cultural values. Mitigation efforts such as data recovery involve the scientific and controlled destruction of a cultural resource site. Once undertaken, the effects are irreversible and the mitigation effort becomes an irretrievable commitment to the resource.

The uses of energy resources and the removal of mineral resources are irreversible commitments of resources. The use of rock resources for road and facility construction is an example (see Table 4-1). The use of fossil fuels during project administration activities would be an irreversible resource commitment (see Table 4-39). Alternatives vary by the amount of energy and mineral resources used; the no-action alternative abstains from the use of these nonrenewable resources at this time.

An irreversible loss occurs when forests of old-growth trees are harvested, fragmented, or removed for the construction of roads or other purposes. Old-growth stands provide key wildlife habitat and are also valued for ecological and aesthetic reasons. Because old-growth stands take more than 150 years to develop, the commitment of this resource to certain uses is reversible over a long period of time. Table 4-8 displays remaining old growth by alternative.

Some long-term uses of the land cause an irreversible loss of soil productivity. Examples of these uses include the establishment of local and collector roads and LTFs. Table 4-30 displays miles of new and reconstructed roads, and Table 4-36 displays LTFs.

Possible Conflicts with Plans and Policies of Other Jurisdictions

Regulations for implementing NEPA require a determination of possible conflicts between the proposed action and the objectives of Federal, State, and local land use plans, policies, and controls for the area. The major land use regulations of concern are the Coastal Zone Management Act (CZMA), Section 810 of the ANILCA, and the State of Alaska's Forest Practices Act. A discussion of each of these determinations is presented below.

Coastal Zone Management Act of 1976 (CZMA)

The CZMA was passed by Congress in 1976 and amended in 1990. This amended law requires Federal agencies conducting activities or undertaking development which affect the coastal zone to ensure that the activities or developments are consistent with the enforceable policies of approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Management Act in 1977 to establish a program that meets the requirements of the CZMA. It contains the standards and criteria for determining consistency for activities within the coastal zone.

The consistency evaluation will consider: Alaska Statute Title 46, Water, Air, Energy, and Environmental Conservation; and the Alaska Forest Practices Act of 1990.

The Forest Service has evaluated the alternatives to ensure that the activities and developments affecting the coastal zone are consistent with approved coastal management programs to the maximum extent practicable. The standards and guidelines for timber management activities in the Project Area meet or exceed those indicated in the Alaska Forest Practices Act and the ACMP.

Evaluating the proposed activities against the enforceable policies for activities within the coastal zone results in a finding that these activities are consistent with the ACMP to the maximum extent practicable. The State of Alaska Division of Governmental Coordination will complete a consistency review of the preferred alternative.

Alaska National Interest Lands Conservation Act of 1980 (ANILCA)

Under Section 810 of the ANILCA, agencies are required to evaluate the effects of proposed actions on subsistence uses of Federal land, and to determine if the proposed action may significantly restrict subsistence opportunities. See the Subsistence section in this chapter for the evaluation of subsistence use effects.

State of Alaska's Forest Practices Act of 1990

On May 11, 1990, Governor Cowper approved the legislature's major revision of the State's Forest Practices Act. The revised act significantly increases the State's role in providing protection and management for important forest resources on State and private lands. The revised Forest Practices Act will also affect National Forest management through its relationship to the ACMP and the Federal CZMA (see above discussion).

For National Forest timber operations such as proposed for the Indian River Project, the effect of the revised Forest Practices Act is essentially two-fold. First, it clarifies that the revised Forest Practices Act is the standard which must be used for evaluating timber harvest activities on Federal lands for purposes of determining ACMP consistency.

Second, it calls for minimum 100-foot buffers on all Class I streams, and it recognizes that ACMP consistency is attainable in Federal timber harvest activities using specific methodologies which may differ from those required by the revised Forest Practices Act or its implementing regulations.

Stream buffers in this project have a minimum width of 100-feet horizontal distance from the edge of either side of Class I streams and those Class II streams which flow directly into Class I streams, in order to comply with the State of Alaska's Forest Practices Act, as well as the TTRA, ACMP, and CZMA. (See Tongass Timber Reform Act, below.)

Compliance With Other Laws and Executive Orders

National Forest Management Act

The National Forest Management Act (NFMA) requires specific determinations regarding consistency with the existing Forest Plan and Regional Guide. It also requires a determination of clearcutting as the optimal method of harvesting, and specific authorization of clearcuts over 100 acres. Final determinations will be made in the Record of Decision for the Final Environmental Impact Statement.

Tongass Land Management Plan and Alaska Regional Guide. This project plan is consistent with the 1997 Tongass Land Management Plan and the Alaska Regional Guide.

Clearcutting as the Optimal Method of Harvesting. The Alaska Regional Guide established management direction and standards for western hemlock-Sitka spruce forest type (Alaska Regional Guide, page 3-18). The Guide states that even-aged management in the form of clearcutting will be used only where this practice is determined to be optimum to meet the objectives and requirements of the Forest Plan, where there is a high risk of dwarf mistletoe reinfection, and where risk of windthrow is determined to be high. Dwarf mistletoe is somewhat of a problem in specific areas within the Indian River Project Area. All harvest units in this project proposed for the harvest method of clearcut with reserves have either a high level of mistletoe infection or a high risk of windthrow. Clearcutting the units will help meet the objective of maintaining fast growing, mistletoe-free stands of mixed species. It is the optimum method of harvesting, considering the following factors referenced in the Alaska Regional Guide:

> Hemlock dwarf mistletoe, *Arcenthobium tsuqense*, an important parasite of western hemlock can best be controlled by clearcutting. Elimination of residual overstory trees infected with dwarf mistletoe prevents infection of western hemlock in the new stand. Risk of blowdown in residual stands is eliminated. The chance of blowdown along cutting boundaries is increased but can be reduced through proper design of cutting units.

In addition to the direction in the Alaska Regional Guide, the Chief of the Forest Service established new provisions in June 1992 for the reduction of clearcutting on National Forest System Lands. The new provisions state that clearcutting is to be limited to areas that involve at least one of seven specific circumstances. The clearcuts prescribed in the Indian River Project Area meet the following circumstances as specified in that direction:

> "To preclude or minimize the occurrence of potentially adverse impacts or insect or disease infestations, windthrow, logging damage, or other factors affecting forest health" (USDA Forest Service 1992).

Clearcuts Over 100 Acres in Size. There are no units in any of the action alternatives which create openings exceeding 100 acres.

Tongass Timber Reform Act

Harvest units would maintain a minimum 100-foot buffer for all Class I streams and Class II streams that flow directly into Class I streams, as required in Section 103 of the TTRA. The actual widths of these buffers would often be greater than the 100-foot minimum. Unit cards include BMPs for protection for all streams of all classes.

Endangered Species Act

The action alternatives would not have a direct, indirect, or cumulative effect on any threatened or endangered species in the Indian River Project Area. A biological assessment and evaluation are included in Appendix B of this Draft EIS.

Bald and Golden Eagle Protection Act

Management activities inconsistent with current bald eagle use within 330 feet of an eagle nest tree are restricted by an Interagency Agreement between the Forest Service and the U.S. Fish and Wildlife Service. One variance from the Agreement would be needed for Alternative B or D, for road construction blasting within one-half mile of a nest tree.

Clean Water Act

The location of harvest units and roads was guided by the standards, guidelines, and direction contained in the 1997 TLMP, the Alaska Regional Guide, and applicable Forest Service manuals and handbooks. The road cards and unit cards (Appendices I and J) contain specific details on practices prescribed to prevent or reduce non-point sediment sources. Implementation with site specific application and monitoring of approved BMPs would comply with State Water Quality Standards Regulations. These regulations provide for variances from anti-deregulation requirements and water quality criteria. The harvest and road building operators would be responsible for compliance, including obtaining any variance required by the State, and would be monitored for compliance by the Forest Service. The Forest Service expects the Indian River Project activities to fully qualify for any variance required by the State, according to the criteria in 18 AAC 70.015.

A monitoring plan to detect and evaluate possible effects of bark accumulations, oil sheens, and surface runoff would be implemented as a part of the permitting process for log transfer facilities (BMP 14.4, FSH 2509.22).

National Historic Preservation Act

Heritage resource surveys have been completed in the Project Area. The State Historic Preservation Officer has been consulted and concurred with the finding that Alternatives A through E would have no effect on heritage resources. Alternative F would have an adverse effect on a small portion of the East Tenakee CCC Trail (Sit-468). Forest Service timber sale contracts contain enforceable measures for protecting any undiscovered heritage resources that might be encountered during sale operations.

Clean Air Act

The action alternatives would not have a direct, indirect, or cumulative effect on air or atmospheric resources. Air quality would be maintained by following the standards and guidelines in the 1997 TLMP.

Wild and Scenic Rivers Act

The 1997 TLMP EIS Record of Decision did not recommend any rivers in the Project Area for inclusion in the National Wild and Scenic Rivers System.

Federal Cave Resource Protection Act of 1988

The action alternatives would not have a direct, indirect, or cumulative effect on any significant cave in the Indian River Project Area. One cave resource in the Project Area has been recommended as a significant cave, but has not been designated at this time.

Executive Order 11988

Executive Order 11988 directs Federal agencies to take action to avoid, to the extent possible, the long- and short-term impacts associated with the occupancy and modification of floodplains. The numerous streams in the Indian River Project Area make it impossible to avoid all floodplains during timber harvest and road construction. The action alternatives include less than 5 acres of timber management activities within floodplains. The design of the developments and the application of BMPs would combine to minimize adverse impacts on floodplains.

Executive Order 11990

Executive Order 11990 requires Federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands. The action alternatives avoid most identified wetlands. However, many small wetlands or muskegs occur as inclusions with forested areas. These areas may be altered by timber harvest or road construction; however, techniques and practices required by the Forest Service would maintain wetland attributes. It is estimated there would only be minimal loss of wetlands with any of the alternatives. Soil moisture regimes and vegetation on some wetlands may be altered in some cases; these altered acres would still be classified as wetlands, and function as wetlands in the ecosystem.

Executive Order 12898

Executive Order 12898 directs Federal agencies to identify and address the issue of environmental justice, i.e., adverse human health and environmental effects of agency programs that disproportionately impact minority and low income populations. The E.O. specifically directs agencies to consider patterns of subsistence hunting and fishing when an agency action may affect fish or wildlife. The issue of environmental justice has been addressed through the Indian River NEPA analysis by identifying minority or low income communities that may be affected by timber management activities; by ensuring that scoping and public involvement activities reach those communities; by evaluating the effects of the alternatives on such communities; and by documenting the analysis in this EIS.

Executive Order 12962

Executive Order 12962 directs Federal agencies, to the extent permitted by law and where practicable, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities. Federal agencies are required to evaluate the effects of federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of the E.O. Planning for the Indian River Project included documentation of existing recreational fisheries opportunities; protection of riparian, water quality, and fisheries habitats; and identification of fisheries enhancement opportunities. Harvest unit and road design are consistent with the standards and guidelines in the 1997 TLMP.

Potential Energy Requirements and Conservation Potential of Alternatives

The implementation of the action alternatives in the Project Area would require the expenditure of energy (e.g., fuel consumption). The amount of energy used varies by alternative based on timber volume harvested and miles of road constructed. The direct effect of the alternatives on energy requirements would be attributed to timber harvest, road construction, and travel necessary to administer the timber sale. Indirect energy requirements include processing wood products and the transport of products to secondary processors and consumers. The estimated total fuel consumption required for each alternative is displayed in Table 4-39.

Table 4-39
Estimated Fuel Consumption (Millions of Gallons) by Alternative

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Preparation and Administration (1.56 gallons/mbf)	0	0.04	0.05	0.04	0.04	0.06
Logging and Transportation (14.8 gallons/mbf)	0	0.37	0.46	0.38	0.38	0.59
Helicopter Logging (7.3 gallons/mbf)	0	0.32	0.26	0.23	0.22	0.38
Road Construction and Maintenance (4,000 gallons/mile)	0	0.13	0.14	0.09	0.13	0.14
Total Consumption	0	0.86	0.91	0.74	0.77	1.17

Source: Mork 1996
*Note: Estimated fuel consumption based on consumption per mbf of sawlog volume and use of an S-64E helicopter.

Natural or Depletable Resource Requirements and Conservation Potential of Alternatives

All alternatives considered in detail are designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulation of mineral and energy activities on the National Forest, under the U.S. Mining Laws Act of May 1872 and the Mineral Leasing Act of February 1920, is shared with the BLM. The demand for National Forest lands access to explore and develop minerals and energy is expected to increase over time.

The action alternatives propose road construction that would increase opportunities for access to the National Forest within the Project Area. This increased access may result in increased activity with regard to potential mineral or energy resource occurrences.

Other Effects

Urban Quality, Historic and Cultural Resources, and the Design of the Built Environment

The Project Area includes the City of Tenakee Springs, a small urban area. However, all of the built-up areas are on private and State land. Therefore, the only applicable concern under this topic is with historic and cultural resources. The goal of the Forest Service Cultural Resource Management Program is to preserve significant cultural resources in their field setting and ensure that they are available in the future for research, social/cultural purposes, recreation, and education. There are adequate standards, guidelines, and procedures to protect cultural resources and to meet the goals of the Cultural Resource Management Program. Cultural resources and the proposed project design are discussed in the Heritage Resources section of this chapter.

Effects of Alternatives on Consumers, Civil Rights, Minorities, and Women

All Forest Service actions have the potential to produce some form of impact, positive and/or negative, on the civil rights of individuals or groups, including minorities and women. The need to conduct an analysis of this potential impact is required by Forest Service Manual and Handbook direction. The purpose of the impact analysis is to determine the scope, intensity, duration, and direction of impacts resulting from a proposed action. For environmental or natural resource actions as proposed for the Indian River Project, the civil rights impact analysis is an integral part of the procedures and variables associated with the social impact analysis. This analysis is discussed in the Economic and Social Values section of this chapter.

The effect of the alternatives on consumers is reflected in the discussion of the various goods and services supplied as a result of the action alternatives. This analysis occurs throughout this chapter as an integral part of the effects analysis on other environmental components.

Effects of Alternatives on Prime Farm Land, Rangeland, and Forest Land

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime land. The Project Area does not contain any prime farm lands or rangelands. Prime forest land does not apply to lands within the National Forest system. In all alternatives, lands administered by the Forest Service are managed with a sensitivity to the effects on adjacent lands.

List of Preparers

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Forest Service: 19 years
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Forest Service: 3½ years
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Soil Scientist, Tongass NF, Juneau RD (5 years)
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Alaska Pulp Team Leader, Tongass NF, Chatham Area (2 years)
Soil Scientist, Tongass NF, Chatham Area (4 years)
Other Relevant Employment
Research Scientist, Oregon State University (2 years)
Research Scientist, Purdue University (2 years)

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B.S. Natural Resources Management, Sheldon Jackson College, Sitka, Alaska, 1991
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Fisheries Certificate, 1991
Forest Engineering Institute, Oregon State University, 1994
Forest Service: 6 years
Presale Forester, Tongass NF, Sitka RD (6 years)

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B.S. Agricultural Economics, University of Vermont, 1980
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Forest Service: 13 years
Landscape Architect, Tongass NF, Chatham Area (13 years)

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Forest Service: 18 years
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District Soil Scientist, Tongass NF, Thorne Bay RD (3½ years)
Soil Scientist, Chugach NF (5½ years)
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B.A., Anthropology, Oregon State University, 1979
B.A., History, Oregon State University, 1979
Forest Service: 16 years
Forest Archeologist, Tongass NF, Chatham Area (5 years)
Archeologist, Tongass NF, Chatham Area (6 years)
Archeology Technician, Tongass NF, Chatham Area (4 years)
Archeology Technician, Malhuer NF (1 year)
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Independent Contractor, Archeology, Pacific NW and SE (2 years)

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B.S., Wildlife Biology, Oregon State University, 1983
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Fish Biologist, Tongass NF, Sitka RD (8 years)
Biological Technician, Tongass NF, Sitka RD (3 years)
Biological Technician, Forestry Sciences Laboratory, Juneau (6 months)
Hydrological/Biological Technician, Tongass NF, Chatham Area (1 year)
Hydrological/Biological Volunteer, Tongass NF, Chatham Area (1 year)

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Master of Forest Resources, Outdoor Recreation Emphasis, University Of Washington, 1977
M.S., Forestry, California State University, Humboldt, 1974
B.S., University of Montana, 1967
Forest Service: 19 years
Lands Forester, Tongass NF, Chatham Area (11 years)
Resource Assistant, Tongass NF, Thorne Bay RD (2 years)
Resource Assistant, Tongass NF, North Prince of Wales RD (2 years)
Forester/Recreation Assistant, Packwood RD (4 years)
Research Assistant, Pacific Northwest Experimental Station, Seattle

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B.S., Natural Resource Economics, Montana State University
Graduate Study, Coastal Zone Management, University of Washington
Forest Service/Private Industry: 4 years

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B.A. Archeology, The Colorado College, 1985
Graduate Study, Cultural Resource Management, University of Nevada, Reno, 1995
Forest Service: 7 years
District Archeologist, Tongass NF, Chatham Area, Sitka RD (2 years)
Archeologist, Tongass NF, Chatham Area (2 years)
Archeological Technician, Tongass NF, Chatham Area (3 years)
Other Relevant Experience:
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Archeological Technician, Crow Canyon Arch. Center, Cortez, CO (6 months)

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B.S., Recreation Area Management, Montana State University, 1979
Graduate Study, Recreation Short-course, Utah State University, 1990
Graduate Study, Leadership and Communications, University of Idaho, 1994
Forest Service: 12 years
Recreation Planner, Tongass NF, Chatham Area (6 years)
Architectural Technician, Chatham Area (4 years)
Architectural Technician, Kootenai NF (2 years)

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B.S., Forest Management, Iowa State University, 1972
Forest Service: 11 years
Forester, Tongass NF, Chatham Area (4 years)
Construction Inspector, Fremont NF, Paisley RD (2 years)
Construction Inspector, Gifford Pinchot NF (2 years)
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Research Forester, PSW Forest and Range Experimental Station (2 years)
Other Relevant Employment
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Forest Service: 19 years
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Fisheries Biologist, Tongass NF, Hoonah RD

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B.S., Wildlife Biology, Oregon State University, 1988
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Wildlife Biologist Trainee, Kisatchee NF, Winn RD (2 years)
Timber Sale Planning and Layout, Umatilla NF, Heppner RD (2 years)

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B.S., Civil Engineering, Marquette University, 1964
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B.S. Wildlife Management, South Dakota State University, 1968
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Command and general Staff College, Ft. Leavenworth, KS. 1990
Forest Service: 12 years
Forest Wildlife Biologist, Tongass NF, Chatham Area (7 years)
Forest Wildlife Biologist, Pike and San Isabel NF (2 years)
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Conservation Officer, South Dakota Game, Fish and Parks (2 years)
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M.S., Botany (Field Naturalist Program), University of Vermont, Burlington, 1990
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Forest Service: 2 years
Ecologist, Tongass NF, Chatham Area (2 years)
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Wildlife Society Certified Wildlife Biologist, 1989
B.A., Biology, Fresno State University, 1976
B.A., English Literature, Fresno State University, 1973
A.A., Liberal Arts, Allan Hancock Junior College, 1971
Forest Service: 18 years
Interdisciplinary Team Leader, Tongass NF, Chatham Area (2 years)
Acting Ketchikan District Ranger, Tongass NF, Ketchikan Area (8 months)
Deputy District Ranger, Tongass NF, Ketchikan Area (2 years)
Resource Officer, Tongass NF, Chatham Area (4 years)
Wildlife Biologist, Shasta-Trinity NF (7 years)
Range Technician, Los Padres NF (2 years)
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Forest Service: 11 years
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Wildlife Biologist, Tongass NF, Sitka RD Planning Team (4 months)
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Biological Sciences Technician (Fisheries), Chugach NF, Cordova RD (8 months)
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Forest Service: 4 years
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Forest Service: 8 years
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Wildlife Biologist/Ecologist, Tongass NF, Chatham Area (2½ years)
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Biologist, Fremont NF, Paisley RD (3 years)

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M.S. Wildlife Biology, South Dakota State University, 1978
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Forest Service: 19 years
Land Management Planner, Tongass NF (5 years)
Wildlife Biologist Planner, Tongass NF (2 years)
Wildlife Biologist, Ouachita NF (12 years)
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Forest Service: 8 years
Soil Scientist/Ecologist, Tongass NF, Sitka RD (5 years)
Soil Scientist, Stanislaus NF, Mi-Wok RD (2 years)
Forestry Technician, Chugach NF, Cordova RD (½ year)
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Forest Service: 8 years
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Ketchikan Public Library
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USDA Forest Service, Tongass NF, Chatham Area, Admiralty National Monument
USDA Forest Service, Tongass NF, Chatham Area, Hoonah Ranger District
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USDA Forest Service, Tongass NF, Chatham Area, Sitka Ranger District
USDA Forest Service, Tongass NF, Chatham Area, Yakutat Ranger District
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USDA Forest Service, Tongass NF, Ketchikan Area, Environmental Coordinator
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Coastal Zone Management Act. July 25, 1976. Public Law 93-370, 90 Stat. 1013; US Code 1982 Title 16, Sections 1451 et seq.

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______. Title 40. Protection of Environment. Chapter V, Parts 1500-1508.

______. Title 36. Parks, Forests, and Public Property. Chapter VIII, Part 800.5.

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Common Abbreviations

ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ANCSA	Alaska Native Claims Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
APC	Alaska Pulp Company
ASQ	Allowable Sale Quantity
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COE	Army Corps of Engineers
CZMA	Coastal Zone Management Act of 1976
dbh	Diameter at breast height
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVC	Existing Visual Condition
FSH	Forest Service Handbook
GIS	Geographic Information System
GMU	Game Management Unit
HCA	Habitat Conservation Area
HIA	Hoonah Indian Association
IDT	Interdisciplinary Team
IRWA	Indian River Watershed Analysis
LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris
mbf	One thousand board feet
mmbf	One million board feet
MIS	Management Indicator Species
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National Forest Management Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
OGR	Old-growth Reserves
PFL	Productive Forest Land
RM	Roaded Modified
RMA	Riparian Management Area
RMO	Road Management Objectives
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SAI	Sale Area Improvement
SIS	Silvicultural Information System
SHPO	State Historic Preservation Officer
SNAP	Scheduling and Network Analysis Program
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
SRD	Sitka Ranger District
SSA	Sediment Source Area
TLMP	Tongass Land Management Plan

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Abbreviations continued

TMS	Transportation Management System
TTRA	Tongass Timber Reform Act
TSZ	Transient Snow Zone
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
VCU	Value Comparison Unit
VMC	Visual Management Class
VQL	Visual Quality Level
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area

Definitions

Abiotic
Conditions that do not include living organisms.

Adfluvial Fish
Species or populations of fish that do not go to sea, but live in lakes or ponds, and travel to streams to spawn.

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980. Public Law 96-487, 96th Congress, 94 Stat. 2371-2551.

Alaska Native Claims Settlement Act (ANCSA)
Approved December 18, 1971. Provides for the settlement of certain land claims of Alaska Natives and for other purposes. Public Law 92-203, 92nd Congress, 85 Stat. 688-716.

Alienated Lands
Non-National Forest System lands.

Allowable Sale Quantity (ASQ)
The maximum quantity of timber that may be sold each decade from suitable lands covered by the Forest Plan (1997 TLMP).

Alluvial Fan
A body of unconsolidated material (including gravel, sand, silt, and clay) deposited by running water, with or without debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley (or V-notch) onto a plain.

Alpine
Parts of mountains above tree growth.

Amenity Values
Resources that are pleasing to the mind or senses. Amenity uses or values cannot be easily measured in dollars. Recreation and scenic quality are examples of amenity values.

Anadromous Fish
Fish that spend part of their lives in fresh water and part of their lives in salt water. Anadromous fish include pink, chum, coho, sockeye, and king salmon, and steelhead trout. There are also anadromous Dolly Varden char.

Background
The distant part of a landscape. The seen, or viewed, area located from three or five miles to infinity from the viewer. (See Foreground and Middleground.)

Glossary

Bark deposition
The settling out and accumulation of bark in the water, commonly referred to as a bark layer, and quantified in inches or centimeters. Usually associated with log transfer facilities.

Bark dispersion
The process of bark being scattered from the point of entry into the water and accumulation by the action of sea currents and tide fluctuations.

Beach Fringe Habitat
Habitat that occurs from the intertidal zone inland 500 feet, and islands of less than 50 acres.

Best Management Practice (BMP)
A practice or combination of practices that, after problem assessment, examination of alternative practices, and appropriate public participation is determined by a state to be the most effective and practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. A BMP is an action-initiating mechanism which eventually leads to the interdisciplinary development of a site-specific prescription. BMPs are found in Forest Service Handbook 2509.22.

Biodiversity
(Also referred to as **Biological Diversity**.) The variety of life forms and processes, including the complexity of species, communities, gene pools, and ecological functions, within the area covered by a land management plan.

Biotic
Pertaining to life or specific life conditions.

Bog
Wetlands where peat accumulation has separated the peatland surface from ground water (e.g., domed bog). They receive their mineral supply solely from atmospheric precipitation (National Wetlands Working Group 1988).

Buffer
An area of undisturbed or lightly disturbed forest reserved to isolate activity areas from sensitive areas.

Cave
Legally defined under federal law as "any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or human-made. Such term shall include any natural pit, sinkhole or other feature which is an extension of the surface," (Federal Cave Resource Protection Act of 1988).

Characteristic Landscape
The naturally established landscape within a scene or scenes being viewed.

Clearcut with Green Tree Retention
See Regeneration Methods.

Glossary

Cohorts
In fisheries management, a group of fish from a given area that are the same age class and species.

Commercial Fishery
The taking or possession of fish, shellfish, or other fishery resources within a designated area for commercial purposes.

Commodity Values
Resources that have a dollar or market value. Timber and minerals are examples of commodity values.

Composition
The specific elements of an entity; for example, the species that constitute a plant community.

Conveyance
The passing of the title of a property from one owner to another.

Cretaceous
Geologic time period 135 million to 63 million years ago.

Cruise
The general activity of determining timber volume and quality.

Cumulative Effects
The impacts on the environment resulting from the addition of the incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions occurring over time.

Devonian
Geologic time period 405 million to 345 million years ago.

Decumbent
Lying or growing along the ground, but erect at or near the flowers.

Direct Employment
Jobs that are immediately associated with timber sales, for example in logging, sawmills, and pulp mills.

Distance Zones
Areas of landscapes denoted by specified distances from the observer (See Foreground, Middleground, and Background). Used as a frame of reference in which to discuss landscape characteristics of management activities.

Ecological Approach
Natural resource planning and management activities that assure consideration of the relationship between all organisms (including humans) and their environment.

Ecosystem
A complete, interacting system of organisms considered together with their environment (for example, a marsh, a watershed, or a lake).

Glossary

Ecosystem Management
The use of an ecological approach to land management to sustain diverse, healthy and productive ecosystems. Ecosystem management is applied at various scales to blend long-term societal and environmental values in a dynamic manner that may be modified through adaptive management.

Encumbrance
Any right or interest that affects value (e.g., mortgages, unpaid taxes, easements).

Endangered Species
Any species of animal or plant which is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Environmental Impact Statement
A statement of environmental effects for a major Federal action prepared for release to the public and other agencies for comment and review prior to a final management decision, as required by Section 102 of the National Environmental Policy Act (NEPA). An impact statement includes the following points: (1) the environmental impact of the proposed action, (2) any adverse impacts which cannot be avoided by the action, (3) the alternative courses of actions, (4) the relationships between local short-term use of the human environment and the maintenance and enhancement of long-term productivity, and (5) a description of the irreversible and irretrievable commitment of resources which would occur if the action were accomplished.

Ephemeral Stream
A stream or portion of a stream which flows only in direct response to precipitation. It receives little or no water from springs and no long-continued supply from melting snow or other sources. Its channel is at all times above the water table. The term may be arbitrarily restricted to streams which do not flow continuously during periods of one month.

Epikarst
The surface of karst. Epikarst is an intensely dissolved veneer consisting of an intricate network of intersecting dissolution-widened fissures, cavities, and tubes. It is this network of intersecting fissures which collects and transports surface waters and nutrients vertically to the underlying karst conduits.

Erosion Processes
Processes which move earth or rock materials from one place to another, such as landslides and weathering.

Estuary
An ecological system at the mouth of a stream where fresh water and salt water mix, and where salt marshes and intertidal mudflats are present. The landward extent of an estuary is the limit of salt-intolerant vegetation, and the seaward extent is a stream's delta at mean low water.

Estuary Fringe Habitat
A 1,000-foot zone around an estuary.

Even-Aged Management
The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. Clearcutting is an example of this type of management.

Even-aged System
A planned sequence of treatments designed to maintain and regenerate a stand with one age class. The range of tree ages is usually less than 20 percent of the rotation.

Existing Visual Condition (EVC)
The level of visual quality or condition presently occurring on the ground. The six existing visual condition categories are:

- **Type I**: Areas which appear to be untouched by human activities.
- **Type II**: Areas in which changes in the landscape are not noticed by the average person unless pointed out.
- **Type III**: Areas in which changes in the landscape are noticed by the average person but they do not attract attention. The natural appearance of the landscape still remains dominant.
- **Type IV**: Areas in which changes in the landscape are easily noticed by the average person and may attract some attention. Although the change in landscape is noticeable, it may resemble a natural disturbance.
- **Type V**: Areas in which changes in the landscape are obvious to the average person. These changes appear to be major disturbances.
- **Type VI**: Areas in which changes in the landscape are in glaring contrast to the natural landscape. The changes appear to be drastic disturbances.

Fen
A tract of low, wet ground containing sedge peat, relatively rich in mineral salts, alkaline in reaction, and characterized by slowly flowing water. Vegetation is generally sedges and greases, often with low shrubs and sometimes a sparse cover of trees. Sphagnum mosses are absent or of low cover. Unlike peatlands (commonly referred to as bogs or muskegs), fens contribute to stable stream flows, provide nutrient input to streams and often contribute to fish rearing habitat.

Fish Habitat
The combined aquatic environment and the immediately surrounding terrestrial environment that afford the necessary physical and biological support systems required by fish species during various life stages.

Flood Plain
The lowland and relatively flat areas joining inland and coastal waters, including debris cones and flood-prone areas of offshore islands; including at a minimum that area subject to a one percent (100-year recurrence) or greater chance of flooding in any given year.

Fluvial Processes
Processes driven by moving water, such as formation of floodplains, alluvial fans or deltas, and stream channel scour.

Forbs
A grouping/category of herbaceous plants which are not included in the grass, shrub or tree groupings/categories; generally smaller flowering plants.

Glossary

Foreground
A term used in visual management to describe the stand of trees immediately adjacent to a scenic area, recreation facility or forest highway. The area is located less than 1/4 mile from the viewer. (See Background and Middleground.)

Forested Land
Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use.

Forested Habitat
All areas with tree cover. Used in this EIS to represent a general habitat zone.

FORPLAN
The forest planning model. A linear programming software package used to analyze planning decisions regarding land use patterns, capital investment, and timber harvest scheduling.

Function
Function is the flow of species, materials, and energy within ecosystems, across landscapes, and through time. Function includes a diversity of processes, such as succession, the biotic food chain, the hydrologic system, and nutrient cycling.

Geographic Information System (GIS)
A system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps to support the decision making process.

Glacial Processes
Processes related to moving ice or glaciers. These processes include scraping away of soils and substrates, deposition of materials held in the ice (e.g., till or moraines), and formation of kettle lakes where ice chunks broke off, were buried, and later melted.

Glacial Till Deposit
Non-sorted, non-stratified sediment laid down by a glacier.

Group User Day
Two or more people engaged in a recreational activity for a day. “Day” is defined as a commercial business, cost per day.

Group Selection
See Regeneration Methods.

Harvesting Method (Cutting Method)
A method by which a stand is logged. Emphasis is on meeting logging requirements while concurrently attaining silvicultural objectives (see Regeneration Method).

Habitat Capability
The estimated maximum number of fish or wildlife that can be supported by the amount and distribution of suitable habitat in an area.

Habitat Conservation Area
See Old-growth habitat reserve.

Glossary

Healthy Ecosystem
An ecosystem in which structure and functions allow the maintenance of biological diversity, biotic integrity, and ecological processes over time.

Heritage Resources
The physical remains of districts, sites, structures, buildings, networks, events, or objects used by humans in the past. They may be historic, prehistoric, architectural, or archival in nature. Heritage resources are non-renewable aspects of our national heritage.

Hierarchy
Reference to the observation that ecosystems occur in a nested arrangement, with smaller ecosystems found within larger ones. The hierarchy organizes the dominant ecological factors as well as the assemblages of plants, animals, and abiotic processes in an hierarchical relationship.

Home Range
A community's "Home Range" is defined as the area regularly accessed by typical day users from that community on an average day. In theory, this is the area which receives the most recreation use by the people of a specific town. This concept creates a radius of between 15 and 30 miles around communities wherein most recreation takes place. While there is no precise definition of "home range," 20 miles is the estimated furthest distance a person in a skiff could travel from and to a community in the daylight and still use a Recreation Place.

Indirect Employment
The jobs in service industries that are associated with timber sales, for example suppliers of logging and milling equipment.

Interdisciplinary Team (IDT)
A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view and a broader range of expertise to bear on the problem.

Irretrievable Commitments
Applies to losses of production or use of renewable natural resources for a period of time. For example, timber production from an area is irretrievably lost during the time an area is allocated to a no-harvest prescription. If the allocation is changed to allow timber harvest, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible Commitments
Decisions causing changes which cannot be reversed. For example, if a roadless area is allocated to allow timber harvest and timber is actually harvested, that area cannot, at a later date, be allocated to Wilderness. Once harvested, the ability of that area to meet Wilderness criteria has been irreversibly lost. Often applies to nonrenewable resources such as minerals and cultural resources.

Isostatic Uplift
A general uplifting of land masses due to a rise in temperature. The weight of ice on the land mass is removed due to increased temperature. With this weight removed, the land rebounds or raises up.

Isostacy
The study of isostatic uplift.

Jurassic
Geologic time period 180 million to 135 million years ago.

Karst
Topography which develops as the result of the dissolution of soluble rocks, such as limestones and marbles. Dissolution of the subsurface strata produces a landscape that is characterized by well-developed subsurface drainage, collapse features such as sinkholes, dry valleys, vertical shafts, caves, and fluted rock surfaces (epikarst).

Karst Vulnerability Assessment
A management tool used to assess the susceptibility or sensitivity of the karst resources to any proposed land use. The thesis of this approach recognizes that not all karst development and associated resources are equal. Vulnerability mapping utilizes the fact that some parts of a karst landscape are more sensitive than others to planned land uses.

Knutsen-Vandenberg Act (KV)
This Act was passed by Congress in 1930 and amended in 1976 to provide for funding reforestation, resource protection, and improvement projects in timber sale areas. The KV Act allows for collecting funds as a portion of the stumpage fee paid by the purchaser. Examples of KV projects are stream bank stabilization, fish passage structures, and wildlife habitat improvement.

Land Use Designation (LUD)
(As used in the 1979 Tongass Land Management Plan) General management direction applied to a Value Comparison Unit or group of Value Comparison Units. These four land use designations are defined as follows.

- **LUD I:** Forest Service recommended Wilderness areas, most of which became Wilderness through the 1980 Alaska National Interest Lands Conservation Act. (ANILCA). In general, these undeveloped areas are managed for solitude and primitive types of recreation, and contain unaltered habitats for plants and animal species. These areas are managed as directed in the 1964 Wilderness Act and ANILCA, as amended.
- **LUD II:** Lands managed in a roadless state to retain their wildland character. Primitive recreational facilities can be built and habitat improvements for fish and wildlife are permitted. Timber harvest on these lands is limited to salvage operations to protect other resources.
- **LUD III**: Lands managed for a variety of uses. The emphasis is on managing for both amenity and commodity oriented uses in a compatible manner to provide the greatest combination of benefits. These areas usually have high amenity values in conjunction with high commodity values. Allowances in calculated potential timber yield have been made to meet multiple-use coordination objectives.
- **LUD IV**: Lands managed to provide opportunities for intensive development of resources. Emphasis is primarily on commodity, or market resources and their use. Amenity values are also provided for. When conflicts over competing resource uses arise, conflicts would most often be resolved in favor of commodity values. Allowances in calculated potential timber yield have been made to provide for protection of physical and biological productivity.

Land Use Designation (LUD)
(As used in the 1996 Tongass Land Management Plan Revision) A defined area of land specific to which management direction is applied.

Land Use Prescriptions
Specific management direction applied to a defined area of land (land use designation as defined in TLMP Revision) to attain multiple use and other goals and objectives.

Landscape
An area composed of interacting and interconnected patterns of habitats (ecosystems), that are repeated because of the geology, land forms, soils, climate, biota and human influences throughout the area. Landscape structure is formed by patches (stands or sites), connections (corridors and linkages), and the matrix. Landscape function is based on disturbance events, successional development of landscape structure, and flows of energy and nutrients through the structure of the landscape. A landscape is composed of watersheds and smaller ecosystems.

Large Woody Debris (LWD)
Any large piece of relatively stable woody material having a diameter of greater than 10 centimeters and a length greater than one meter that intrudes into the stream channel.

Layout
Planning and mapping (using aerial photos) of harvest and road systems needed for timber harvest in a given area. Also can refer to the process of on-the-ground designation of roads and harvest units.

Log Transfer Facility (LTF)
Includes the site and structures used for moving logs and timber products from land-based transportation forms to water-based transportation forms (or vice versa). LTF siting and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed terminal transfer facility.

Logging Systems
- **Helicopter Logging.** This system consists of slinging logs underneath large helicopters and flying them (normally downhill) to the landing. Helicopters are typically used only in situations where road access is precluded or to accomplish non-clearcut harvest objectives.
- **Shovel Logging.** The process of moving logs from the stump to the landing by repeated swinging with a track-mounted swing boom loader. Logs are decked progressively closer to the road with each pass of the loader until they are finally decked at the roadside. This system is best used on well-drained sites with side slopes of less than 20 percent.
- **Skyline Logging.** Several cable systems used in Alaska and the Pacific Northwest are collectively called skyline systems. Among the types included in this category are live skyline (including gravity systems), slackline and running skyline. These systems generally allow for yarding distances of over 1,000 feet and keep one end or all of the log suspended above the ground for most or all of the yarding distance.

Management Area
Combinations of adjacent VCUs having common management direction, as defined in the 1979 Tongass Land Management Plan.

Matrix
The most extensive and connected landscape element that plays the dominant role in landscape functioning. Also, a landscape element surrounding a patch.

Glossary

Maximum Disturbance Threshold (MDT)
The amount of disturbance (such as timber harvest) allowed in any given area in order to meet the intent of the Visual Quality Objective (VQO) for that area.

- Maximum Disturbance Threshold (MDT) Retention: no more than 8% of the area may be in a disturbed condition at any one time.
- Partial Retention: no more than 16% of the area may be in a disturbed condition at any one time.
- Modification: No more than 25% of the area may be in a disturbed condition at any one time.
- Maximum Modification: No more than 35% of the area may be in a disturbed condition at any one time .

Metamorphic rock
Rock which has been formed in response to changes in temperature, pressure, and temperature, which take place, in general, below the surface of the earth.

Microclimate
The temperature, moisture, wind, pressure, and evaporation (climate) of a very small area that differs from the general climate of the larger surrounding area.

Middleground
The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the landscape. The area is located from 1/4 to 3-5 miles from the viewer. (See Foreground and Background.)

Mitigation
These measures include avoiding an impact by not taking a certain action or part of an action; minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

National Environmental Policy Act (NEPA)
Passed by Congress in 1969, an act ceclaring a National policy to encourage productive and enjoyable harmony between humans and their environment; to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans; to enrich the understanding of the ecological systems and natural resources important to the nation; and to establish a Council on Environmental Quality. This act requires the preparation of environmental impact statements for federal actions that are determined to be of major significance.

National Forest Management Act (NFMA)
A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act and requires the preparation of Forest Plans.

Natural Variability
Variability in landscape/ecosystem composition, structure and function that has occurred through recent adaptive evolutionary time.

Nonforest Land
Land having less than ten percent tree cover. Land that has never supported forests and lands formerly forested but now developed for such nonforest uses as crops, improved pasture, etc.

Non-productive Forest Land
Forest land that does not produce or is incapable of producing more than twenty cubic feet per acre per year of industrial wood.

Old-Growth Forest
Ecosystems distinguished by the later stages of forest stand development that differs significantly from younger forests in structure, ecological function, and species composition. Old-growth forest is characterized by a patchy, multi-layered canopy; trees that represent many age classes; large trees that dominate the overstory, large standing dead (snags) or decadent trees; and higher accumulations of large down woody material. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context. Also defined as timber stands over 150 years in age with an average volume of at least 8,000 board feet per acre.

Old-Growth Habitat Reserve.
A contiguous unit of old-growth forest habitat to be managed to maintain the integrity of the old-growth forest ecosystem. A system of large, medium, and small habitat reserves that are part of a landscape conservation strategy used to address National Forest Management Act requirements to maintain habitat to support viable wildlife populations well distributed across the Tongass National Forest. Also known as Habitat Conservation Areas (HCAs).

- **Large Reserves:** A landscape of at least 20,000 acres of productive old-growth forest, within a landscape of at least 40,000 acres. To address habitat quality, at least 50 percent (10,000 acres) of the old growth must be highly productive. To ensure interaction of species and dispersal between large reserves, they must be no more than 20 miles apart.
- **Medium Reserves:** A landscape of at least 5,000 acres of productive old growth of which at least 2,500 acres must be the highly productive component. Old growth must occur within a landscape of at least 10,000 acres. Medium reserves should be no less than 8 miles apart to facilitate dispersal and recolonization.
- **Small Reserves:** Provide at least one 800 acres block of productive old growth forest within an area of at least 1600 acres within each 10,000 acres landscape (e.g. 16 percent of each VCU).

Overstory
In a stand with several vegetative layers, the overstory is the uppermost layer usually formed by the tallest trees.

Overstory Removal
See Regeneration Methods.

Paleozoic
Geologic time era 600 million to 230 million years ago.

Palustrine
Nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.50 percent.

Patch
Ecosystem elements (such as areas of vegetation) that are relatively homogeneous internally and that differ from what surrounds them.

Patch Clearcuts for a percentage of a unit's volume
See Regeneration Methods.

Glossary

Pattern
The spatial arrangement of landscape elements (patches, corridors, matrix) that determines the function of a landscape as an ecological system.

Plant Association
(a) A potential natural plant community of definite floristic composition and uniform appearance; (b) A basic unit of vegetation classification based on the climax plant community; a distinctive combination of vascular plants at climax; (c) Stands of vegetation with similar combinations of species united into abstract types; a basic unit in plant community classification; (d) An arbitrary grouping of plant communities into a type within environmental gradients and the distribution of populations along the gradients.

Plant Community
A unit of vegetation that is relatively uniform in structure and floristic composition and consists of competing plants of one or more species in a common location.

Plate tectonics
A branch of geology concerned with seismic activity and movement of continents, based on the theory that the earth's surface is composed of a small number of large, semi-rigid sections that float across the mantle.

Plucking Post
Snag or log routinely used as a perch by hawks and owls where prey is eaten. Scattered feathers give the appearance of "plucked" birds.

Pole/Young Sawtimber Stage
The stage following timber harvest, usually 26 to 150 years, when canopy closure decreases the amount of light that reaches the forest floor. This stage is associated with a rapid reduction in understory biomass.

Potential Yield
The maximum harvest that is possible given the optimum perpetual sustained-yield harvesting level attainable with intensive forestry on regulated areas and considering productivity of the land, conventional logging technology, standard silvicultural treatments, and relationships with other resource uses and the environment.

Precommercial Thinning
The practice of removing some of the trees of less than marketable size from a stand in order to achieve various management objectives.

Productive Forest Land
Forest land that produces or is capable of producing more than twenty cubic feet per acre per year of industrial wood.

Recreation Opportunity Spectrum (ROS)

A system for planning and managing recreation resources that categorizes recreation opportunities into seven classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area and the relative density of recreation use. The ROS classes are:

- **Primitive.** An unmodified environment generally greater than 5,000 acres in size and located generally at least 3 miles from all roads and other motorized travel routes. A very low interaction between users (generally less than 3 group encounters per day) results in a very high probability of experiencing solitude, freedom, closeness to nature, tranquillity, self-reliance, challenge, and risk. Evidence of other users is low. Restrictions and controls are not evident after entering the land unit. Motorized use is rare.

- **Semi-Primitive Non-Motorized.** A natural or natural-appearing environment generally greater than 2,500 acres in size and generally located at least 1/2 mile but not further than 3 miles from all roads and other motorized travel routes. Concentration of users is low (generally less than 10 group encounters per day), but there is often evidence of other users. There is a high probability of experiencing solitude, freedom, closeness to nature, tranquillity, self-reliance, challenge, and risk. There is a minimum of subtle on-site controls. No roads are present in the area.

- **Semi-Primitive Motorized.** A natural or natural-appearing environment generally greater than 2,500 acres in size and located within 1/2 mile of primitive roads and other motorized travel routes used by motor vehicles; but not closer than 1/2 mile from better-than-primitive roads and other motorized travel routes. Concentration of users is low (generally less than 10 group encounters per day), but there is often evidence of other users. Moderate probability of experiencing solitude, closeness to nature, and tranquillity, with a high degree of self-reliance, challenge and risk in using motorized equipment. Local roads may be present; along saltwater shorelines there may be extensive boat traffic.

- **Roaded Natural.** Resource modification and utilization are evident, in a predominantly natural-appearing environment generally occurring within 1/2 mile from better-than-primitive roads and other motorized travel routes. Interactions between users may be moderate to high (generally less than 20 group encounters per day), with evidence of other users prevalent. There is an opportunity to affiliate with other users in developed sites but with some chance for privacy. Self-reliance on outdoor skills is only of moderate importance with little opportunity for challenge and risk. Motorized use is allowed.

- **Roaded Modified.** Vegetative and landform alterations typically dominate the landscape. There is little on-site control of users except for gated roads. There is moderate evidence of other users on roads (generally less than 20 group encounters per day), and little evidence of others or interactions at campsites. There is opportunity to get away from others but with easy access. Some self-reliance is required in building campsites and use of motorized equipment. A feeling of independence and freedom exists with little challenge and risk. Recreation users will likely encounter timber management activities.

- **Rural.** The natural environment is substantially modified by land use activities. Opportunity to observe and affiliate with other users is important as is convenience of facilities. There is little opportunity for challenge and risk and self-reliance on outdoor skills is of little importance. Recreation facilities designed for group use are compatible. Users may have more than 20 group encounters per day.

- **Urban.** Urbanized environment with dominant structures, traffic lights and paved streets. May have natural appearing backdrop. Recreation places may be city parks and large resorts. Opportunity to observe and affiliate with other users is very important as is convenience of facilities and recreation opportunities. Interaction between large numbers of users is high. Outdoor skills, risk and challenge are unimportant except for competitive sports. Intensive on-site controls are numerous.

Glossary

Recreation Place
An area that has natural characteristics which attract people. Examples of natural attractors are sandy beaches, anchorages, and freshwater. Recreation Places are represented on maps and in GIS as polygons. Each Recreation Place has recreation activities associated with it. Some examples of these activities are:

- viewing scenery/wildlife
- boating, hiking
- stream/saltwater/lake fishing
- dispersed camping
- big game hunting.

Recreation Site
A specific site and/or facility occurring within a Recreation Place (excluding anchorages which are not physically in a Recreation Place but are connected to the nearest one in the data base tables.) Recreation Sites are represented by points or stars on the maps in Appendix G. Some examples of Recreation Sites are:

- recreation cabins
- trail heads
- anchorages/mooring buoys

Regeneration (Reproduction) Methods
A cutting method by which new age class is created. For this project, the methods are Clearcutting with Green Tree Retention, Patch Clearcuts for a percent of a unit's volume, Overstory Removal, Group Selection, and Single Tree Selection (see Harvesting Methods). See Chapter 2 for a more detailed discussion of each method.

Even-aged Methods: Methods to regenerate a stand with a single age class:

- **Clearcutting with Green Tree Retention:** a method of regenerating an even-aged stand in which a new age class develops in an exposed microclimate after removing most of the trees in the stand in a single cutting. Retained trees are left to attain goals other than regeneration.
- **Overstory Removal**: The cutting of trees comprising an upper canopy layer in order to release trees or other vegetation in an understory.
- **Patch Clearcuts for a Percent of a Unit's Volume**: for this project, clearcuts generally less than 10 acres in size dispersed throughout the identified unit. The clearcuts remove, on a unit-specific basis, either 20, 35, or 50 percent of the unit's volume.

Uneven-aged (Selection) Methods: Methods of regenerating a forest stand, and maintaining an uneven-aged structure, by removing some trees in all size classes either singly or in small groups.

- Group Selection: a method of regenerating uneven-aged stands in which trees are removed, and new age classes are established, in small groups.
- Single (Individual) Tree Selection: a method of creating new age classes in uneven-aged stands in which individual trees of all size classes are removed more or less uniformly throughout the stand to achieve desired stand structural characteristics.

Resident Fish
Fish that reside in fresh water on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Resilience
The ability of an ecosystem to maintain diversity, integrity and ecological processes following disturbance.

Response Reach
A sensitive section of a stream which will reflect change in the upstream sediment budget (Paustian et al. 1996).

Restoration
The long-term placement of land back into its natural condition or state of productivity.

Rich Fen
An area of sedge peat accumulation, with slow internal drainage by seepage down gentle gradients. The soils are primarily organic (histosols) with one to two meters of sedge peat accumulated. The slow moving water is enriched by nutrients (especially calcium) from upslope materials such as limestone. The vegetation generally reflects the water quality and quantity, resulting in grass fens without trees or shrubs, shrub fens, and treed fens (National Wetlands Working Group 1988).

Riparian Area
The area including a stream channel, lake or estuary bed, the water itself, and the plants that grow in the water and on the land next to the water.

Riparian Management Area (RMA)
Land areas delineated in the Forest Plan (1997 TLMP) to provide for the management of riparian resources. Specific standards and guidelines, by stream process group, are associated with riparian management areas. Riparian management areas may be modified by watershed analysis.

Road Management Objective (RMO)
Defines the intended purpose of an individual long-term or short-term road based on management Area direction and access management objectives. Road management objectives contain design, operation, and maintenance criteria.

Road, Arterial
A forest road that provides service to large land areas and usually connects with other arterial roads or public highways.

Road, Collector
A forest road that serves smaller land areas than an arterial road and usually connects forest arterial roads to forest local roads or terminal facilities. Collector roads are usually long-term facilities.

Road, Local
A forest road that connects terminal facilities with forest collector, forest arterial, or public highways. Usually forest local roads are single-purpose transportation facilities and can either be long or short term in nature.

Road, Long-term
Roads developed and operated to provide either continuous or intermittent access for long-term land management and resource needs.

Road, Short-Term
Road developed and operated for a limited time period but which is likely to be extended during a future entry and which ceases to exist as a transportation facility after the purpose for which it was constructed is completed. Short-term roads are considered part of the Forest transportation network.

Glossary

Road, Specified
A road and its related transportation facilities and appurtenances shown on the Sale Area Map and listed in the Timber Sale Contract.

Road, Temporary
For National Forest timber sales, temporary roads are constructed by the timber purchaser to harvest timber on a one-time basis. These logging roads are not considered part of the permanent forest transportation network; stream crossing structures are removed, erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

Roadless Inventory
This is a list of areas which meet the minimum criteria for potential inclusion in the National Wilderness System. Identifying this potential does not imply that areas should or should not be recommended for designation as Wilderness, but is intended to portray the remaining undeveloped portions of the National Forest for which Wilderness is a future option. To qualify, an area must contain at least 5,000 acres of undeveloped land that does not contain improved roads maintained for travel by passenger-type vehicles. However, areas less than 5,000 acres may qualify if they are a self-contained ecosystem such as an island, an area contiguous to existing Wilderness, or are ecologically isolated by topography, and manageable in a natural condition. This inventory was used for evaluating an area's capability and availability for Wilderness recommendation. This type of planning is done at the forest level.

Rotation
The planned number of years between the formation and regeneration of a crop or stand of trees and its final cutting at a specified stage of maturity.

Rotation Age
The age of a stand when harvested at the end of a rotation.

Second-Growth Forest
Forest growth that has regenerated naturally or has been planted after some drastic interference (for example, clearcut harvest, serious fire, or insect attack) with the previous forest growth.

Sediment Source Area (SSA)
Steep, highly dissected uplands that are primary source areas for sediment delivery to stream systems. Snow avalanching, mass wasting, V-notch sideslopes, and rill erosion are the dominant erosion processes.

Seedling/Sapling Stage
The stage following timber harvest when most colonizing tree and shrub seedlings become established (usually 1 to 25 years). Also referred to as the understory colonization stage.

Sensitivity Level
See Visual Sensitivity Level.

Silurian
Geologic time period 425 million to 405 million years ago.

Silviculture
Forest management practices that deal with the establishment, development, reproduction, and care of forest trees.

Single Tree Selection
See Regeneration Methods.

Slash
Debris left over after a logging operation, such as limbs, bark, and broken pieces of logs.

Soluble Rock
Rock that can be easily dissolved, such as limestone.

Special Interest Areas
These are areas possessing unique or unusual scenic, historic, prehistoric, scientific, natural, or other characteristics. The objective of designating and managing such areas is to protect their unique values and, where appropriate, to foster public use and enjoyment of these areas. These areas may be designated as scenic, recreational, historical, archaeological, geological, botanical, zoological or paleontological.

Species of Concern
Those species of plant or animal which are under consideration (by US Fish and Wildlife Service and National Marine Fisheries Service) for listing as threatened or endangered, but which are provided no statutory protection under the Endangered Species Act.

Stand
A contiguous group of trees sufficiently uniform in age class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.

Stand Structure
The horizontal and vertical distribution of forest stand components, including the height, diameter, crown layers and stems of trees, shrubs, herbaceous understory, snags, and down woody debris.

State Historic Preservation Officer (SHPO)
State-appointed official who administers Federal and State programs for cultural resources.

Strata
See Volume strata.

Stream Class
A means to categorize stream channels based on their fish production values. There are four stream classes on the Tongass National Forest:

- **Class I**. Streams and lakes with anadromous or adfluvial fish habitat; or high quality resident fish waters listed in Appendix 68.1, Region 10 Aquatic Habitat Management Handbook (FSH 2609.24), June 1986; or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.
- **Class II**. Streams and lakes with resident fish populations and generally steep (6-15 percent) gradient (can also include streams from 0-5 percent gradient), where no anadromous fish occur, and otherwise not meeting Class I criteria. These populations have limited fisheries values and generally occur upstream of migration barriers or have other habitat features that preclude anadromous fish use.
- **Class III**. Perennial and intermittent streams with no fish populations but which have sufficient flow or transport sufficient sediment and debris to have an immediate influence on downstream water quality of fish habitat capability. These streams generally have bankfull widths greater than 5 feet and are highly incised into the surrounding hillslope.

Glossary

- **Class IV**. Intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality or fish habitat capability. These streams generally are shallowly incised into the surrounding hillslope.
- **Non-streams**. Rills and other watercourses, generally intermittent and less than one foot in bankfull width, little or no incisement into the surrounding hillslope, and with little or no evidence of scour.

Sub-Basin
A small tributary watershed within a larger watershed.

Subsistence Use
The customary and traditional use by rural Alaskan residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non edible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing; for personal or family consumption; and for customary trade.

Successional Stage
One stage in a series of changes affecting the development of a biotic community. On its path to a climax stage, the community will pass through several stages of adaptation to environmental changes.

Sustainability
The ability of an ecosystem to maintain over time ecological processes and functions, biological diversity, and productivity.

Tectonic Processes
Processes which result in deformation of the earth s crust, such as folding, faulting, mountain building, and movement of blocks of rock. These processes influence the bedrock geology and the gross landforms present in an area.

Tentatively Suitable Forest Land
Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary of Agriculture or the Chief of the Forest Service; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soil productivity or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within 5 years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Thousand Board Feet (mbf)
A method of timber measurement in which the unit is equivalent to 1,000 square feet of lumber one inch thick.

Threatened Species
A species of plant or animal which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Timber Appraisal
Establishing the fair market value of timber by taking the selling value minus costs for manufacturing and transporting the logs from the stump to the manufacturer, and including an allowance for profit and risk.

Timber Entry
A term used to refer to how far into the timber rotation an area is on the basis of acreage harvested. For example, if an area is being managed for three entries over a 100-year rotation, the first entry would be completed when one-third (approximately 33 percent) of the available acreage is harvested (usually in 30-40 years); the second entry would be completed when two-thirds (approximately 66 percent) of the available acreage is harvested (usually 60-70 years); the third entry would be completed when all of the available acreage is harvested (at the end of the rotation).

Timtype
A source of data contained in the Forest Service Geographic Information System (GIS) database. The forest is mapped into areas/stands/polygons based on vegetation composition, stocking, and productivity characteristics that comprise a GIS data layer referred to as Timtype.

Tongass Land Management Plan (1997 TLMP)
The ten-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried out within the Forest. See also Land Use Designation.

Turbidity
A measure of suspended sediments.

Understory
Anything growing in a stratum definitely below the main crown canopy.

Understory-Colonization Stage
The stage following timber harvest when most of the colonizing tree and shrub seedlings become established, usually 1 to 25 years.

Uneven-Aged Management
The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Group and individual tree selection are examples of this type of management.

Uneven-aged System
A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

Value Comparison Unit (VCU)
First developed for the 1979 Tongass Land Management Plan as distinct geographic areas that generally encompass a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. There are 926 units established to provide a common set of areas for which resource inventories could be conducted and resource value interpretations made.

Glossary

Variety Class
Visual classification which determines those landscapes which are most important and those which are of lesser value from a standpoint of scenic quality. The classification is based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic quality:

- **Class A - Distinctive**: Refers to those areas where features of landform, vegetative patterns, water forms, and rock formations are of unusual or outstanding visual quality.
- **Class B - Common**: Refers to those areas where features contain variety in form, line, color, and texture or combinations thereof but which tend to be common throughout the character type and are not outstanding in visual quality.
- **Class C - Minimal**: Refers to those areas whose features have little change in form, line, color, or texture. Includes all areas not found under Classes A and B.

Visual Management Class (VMC)
Management guidelines based on a synthesis of the Visual Quality Objectives and Visual Absorption Capability. Each of five VMCs describe a particular level of management objectives and the effort required to meet it.

Visual Sensitivity Level
Sensitivity Levels are the measure of people's concern for the scenic quality of the National Forests. Sensitivity Levels are determined for land areas viewed by those who are traveling through the forest on developed roads and trails; using areas such as campgrounds and visitor centers; or recreating at lakes, streams, and other water bodies. Three Sensitivity Levels are employed, each identifying a different level of user concern for the visual environment:

- **Level 1** - Includes all seen areas from primary travel routes, use areas and water bodies where at least 3/4 of the forest visitors have a major concern for scenic qualities.
- **Level 2** - Includes all seen areas from primary travel routes, use areas and water bodies where fewer than 1/4 of the forest visitors have a major concern for scenic qualities.
- **Level 3** - Includes all seen areas from secondary travel routes, use areas and water bodies where less than 1/4 of the forest visitors have a major concern for scenic qualities.

Visual Quality Objective (VQO)
Measurable standards reflecting five different degrees of landscape alteration based upon a landscape s diversity of natural features and the public s concern for high scenic quality. The five categories of VQOs are:

- **Preservation:** Permits ecological changes only. Applies to wilderness areas and other special classified areas.
- **Retention:** Provides for management activities that are not visually evident; requires reduction of contrast through mitigation measures either during or immediately after operation.
- **Partial Retention:** Management activities remain visually subordinate to the natural landscape. Mitigation measures should be accomplished within one year of project completion.
- **Modification:** Management activities may visually dominate the characteristics landscape. However activities must borrow from naturally established form line color and texture so that its visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.
- **Maximum Modification:** Management activities may dominate the landscape. Mitigation measures should be accomplished with five years of project completion.

Volume
Amount of wood in a stand of timber based on standing net board feet per acre by Scribner Rule.

Volume Strata
Divisions of old-growth timber volume derived from the interpreted timber type data layer (TIMTYP) and the common land unit data layer (CLU). Three volume strata (low, medium, and high) are recognized in the Forest Plan (1997 TLMP) for each Administrative Area.

V-notch
A deeply incised valley along some waterways that would look like a "V" from a frontal view. These abrupt changes in terrain features are often used as harvest unit or yarding boundaries.

Watershed
The area that contributes water to a drainage or stream. Portion of the forest in which all surface water drains to a common point. Watersheds can range from tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

Watershed Analysis
A systematic procedure for characterizing and evaluating ecological processes within a watershed, for use in ecosystem management and project planning. A procedure for assessing important geomorphic processes and functions, and for describing key riparian, wetland, and aquatic habitat conditions and trends. Focuses interdisciplinary discussion on key watershed-level management issues, and provides a basis for integrating project designs. (See Appendix J in 1997 TLMP, for watershed analysis from an aquatic perspective.)

Wetlands
Areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include peatlands, muskegs, marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.

Wild and Scenic Rivers Systems
Determination of eligibility is the result of a process used for TLMP which is described in the "Guidelines for Eligibility, Classification and Management of Wild and Scenic Rivers" (U.S. Department of Interior and U.S. Department of Agriculture, 1982). Determination of eligibility and suitability of rivers for the Wild and Scenic Rivers System is done at the forest planning level and is not within the scope of project level planning.

Wilderness
Areas designated by congressional action under the 1964 Wilderness Act or subsequent Acts. Wilderness is defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historic value as well as ecologic and geologic interest. On the Tongass National Forest, Wilderness has been designated by ANILCA and the Tongass Timber Reform Act (TTRA).

Glossary

Wildlife Analysis Area (WAA)
Alaska Department of Fish and Game administrative designation of an area that includes one or several Value Comparison Units (VCUs) for the purpose of wildlife analysis.

Wildlife Habitat
The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Wind Processes
Processes driven by prevailing or storm winds, such as wind snap of tree trunks, blowdown, and deformation of the typical tree crown shape to a flagged form, with most branches growing in the direction of the wind (e.g., krummholz trees at timberline).

Windthrows
Areas where trees are uprooted, blown down, or broken off by storm winds.

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